The Context of Communication and a Child's Failure in the Concrete-Operations Tests of Piaget

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Abstract

This thesis is concerned with the explanation for young children's failure on Piagetian concrete-operations tests. The issue is of considerable importance because it relates directly to the process by which a child becomes capable of concrete-operational thinking.

We investigate a claim that, contrary to Piaget's view, young children may fail on the tests because they are misled about the reference of the critical questions by the non-verbal communicative contexts. It is suggested that young children could be in the habit of giving only non-literal interpretations to test instructions. Non-literal interpretations are constructed primarily on the basis of what the context of utterance suggests. Where these interpretations do not correspond with the intended literal interpretation of experimenter's meaning, the children will be misled about the reference of the test instructions and will give incorrect responses based on the incorrect interpretations.

We try to account for young children giving only non-literal interpretations in terms of the evidence that children depend on their sensitivity to social situations for the development of language, and for responding to linguistic expressions which are only partially grasped. We review studies by McGarrigle and Donaldson (1975) and McGarrigle, Grieve and Hughes (1978) who proposed that situational clues cause young children to give incorrect interpretations and incorrect responses in the Conservation and Class Inclusion tests respectively.

We report experiments carried out to further investigate the new account. These experiments involved a test (Tower test) which was new but which was similar to one of the Piagetian tests (Conservation test)

in design. The young children studied behaved in the manner predicted by the new account of their failure, giving considerable weight to what the situation of the test suggested about the experimenter's intention for the critical question asked. This resulted in responses which we termed Yes-responses. The responses given where less weight was assigned to the situational suggestion were termed No-responses. The results of a later experiment showed that the same children who give the supposedly more context-dependent non-conserving responses on the Conservation test are the ones who give Yes-responses on the new test. Similarly, the children who give conserving responses on the Conservation test are more likely to give No-responses on the new test.

However, our final experiment led to the important discovery that young children do not assign preferential weight to situational suggestions where the expression to be interpreted has more determinate reference than the ones encountered in the Tower test or the conservation question. This result indicated that the key to the children's difficulty might reside in the particular expressions used in these tests - the deictic term 'them' (Tower test) and the quantitative term 'more' (Conservation test) which behaves in a manner similar to deictics.

In the conclusions, we propose an account of the developmental transition from non-conserving to conserving responses in terms of our speculations about the change from Yes-responses on the Tower test to No-responses. This account centres on the indeterminacy surrounding the key expressions in these tests and explains the developmental change by appealing both to a decreasing reliance on non-verbal clues and to a restriction of the indeterminacy of these terms imposed on them by the five-year old child.

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CHAPTER 1

Introduction and General Theoretical Background

Introduction

This thesis is concerned with a claim that, contrary to Piaget's view, the so-called pre-operational child may fail on Piaget's concrete-operations tests simply because the child is misled about the experimenter's intended referent for the critical questions by the non-verbal communicative contexts of the questions. Specifically, the child gives considerable weight to what the non-verbal contexts of communication suggest about the experimenter's intentions. Where such suggestions conflict with speech, the child arrives at interpretations which are at variance with intended literal interpretations. Consequently, incorrect responses are produced.

Piaget's claim is that the preoperational child fails such tests only because of his incapacity to carry out the intellectual decentring required by the tests. Decentring involves taking into account and coordinating several important aspects of an object of reasoning itself, such that objective judgements are reached which are independent of the reasoner's own point of view or situation.

Children referred to as 'preoperational' are 2 to 7 years of age, and the term denotes the second of the four main cognitive developmental stages postulated by Piaget. Concrete-operations tasks test for the presence of certain special rational abilities which were believed by Piaget to develop at the beginning of the succeeding concrete-operations stage. According to him, the abilities are made possible essentially by the development of particular cognitive structures which he described as logico-mathematical.

1.1.1 The Motivation for the Study

The preoperational child's failure on the concrete-operations tasks relates directly to the process by which he becomes capable of concrete-operational thinking. Thus, if we are able to give a correct account for the child's failure at this stage, development to the concrete-operations stage will be explained. This is why great importance is attached to investigation of this question and a need is felt to have an account of the critical change which is as accurate as possible.

It would only be natural to ask why an account should be considered which differs from Piaget's existing one.

In recent years, the evidence on which Piaget based his account has been challenged. He took it for granted that the so-called preoperational children do not possess the special abilities which the concrete-operations tasks test, and it happens that his observations depend in large part on this assumption. A number of studies carried out with modified versions of some of Piaget's tasks suggest that children (especially 4 to 7 year olds) who fail the original forms of the tasks may not, in fact, lack the abilities which the tasks are supposed to test; hence our use of the qualification 'so-called' for the term 'preoperational' taken to describe their stage of development. We shall use the alternative term 'young children' to characterize this age group.

As a result of these more recent studies, a number of alternative explanations have been put forward for children's failure on the Conservation Tasks, the Class Inclusion Tasks, and the Spatial Perspective Tasks. The one being considered in this thesis was first put forward for the first two tasks by McGarrigle and Donaldson

(1975), and McGarrigle, Grieve and Hughes (1978) respectively. This explanation recognizes the inherent communicative function underlying speech. This is different from the approach of Piaget who emphasized the representative function of language. (Piaget and Inhelder (1969)). In the communicational approach, it is considered that there is more to speech than the mere utterance of linguistic units symbolizing thought operations. We use speech to communicate messages about experience and purpose, and because speech is relative to a rich consciousness of surroundings, the same sentence may be used to communicate different messages in different circumstances. Interpretation of speech, therefore, necessarily involves taking into account the entire perceived context of speech (real or imagined).

The important implication of the above view of how communication functions is that we may not always grasp the message of an utterance even though we know what its words denote. There is considerable room for misunderstanding. Specifically, we may take the context of an utterance into account in such a way that we cannot understand its intended message.

Further details of the close relationship which exists between messages understood and the contexts of utterances in normal circumstances, as well as how this relationship can work against young children in test situations, will be given later in this chapter. First, we shall discuss Piaget's work in more detail, beginning with a general account of his theory of cognitive development. Among other things, this will help us to appreciate better the kind of relationship which exists between his claim and the present alternative.

1.2.1 The Piagetian Theory of Cognitive Development

A cognitive developmental psychologist begins by trying to identify the outstanding differences between the 'average' adult and the 'average' child.[1] He then goes on to try to explain the processes whereby the child overcomes the differences. For Piaget and many other psychologists, an outstanding difference between the adult and the child is that the adult can deal effectively with the non-present, and with the hypothetical. To quote from Flavell's book on Piaget's work and ideas, "His conceptual world is full of informal theories about self and life, full of plans for his and society's future, in short full of ideation which goes far beyond his immediate situation, current interpersonal dealings, and so on." Flavell, 1963, p. 223. The Young child, on the other hand, deals largely with the present; with the here and now. It follows

that an account of cognitive development is essentially an account of how the child becomes able to deal with the non-present and the hypothetical.

According to Piaget, a major factor which makes for the change is the development of the symbolic function. This is the function which allows the individual to make representations of objects and events in his environment. The representations are made in different forms, for example; deferred imitation, mental imagery, symbolic games, drawing and language. The different forms do not all appear at the same time in development, and each one continues to undergo changes in its quality, but, according to Piaget, they all spring from the same source in development.

The development of the general symbolic function commences when the child begins towards the end of the second year to internalize his transformed and properly organized sensorimotor actions. (Sensorimotor actions become transformed as a result of their application to a variety of objects.) The development marks the end of the first major stage - the Sensorimotor stage. It also marks the beginning of the Preoperational stage. (For details of the first stage, see Piaget, 1952a, 1954 and 1951.)

As development proceeds, the internalized actions themselves undergo transformations, becoming more and more divested of their concrete substantial qualities. The actions also become organized into systems or structures. These are the so-called cognitive structures. The term 'operational' is used by Piaget to refer to an internalized action which is an integral part of an organized network of related actions. It is not until the end of the preoperational stage, or the beginning of the Concrete-operations stage, that internalized actions become properly organized as well

as reversible. This explains the name 'pre-operational'.

The networks of internalized actions being what they are, make it possible for the developing child to reason about or take into account several aspects of the environment at the same time; that is, to decentre with respect to representations.

However, it is not until the Formal operations stage (the final major stage of development - from about 11½ years) that the child, now an adolescent, begins to represent the non-actual. In spite of his huge developments, the structuring and organizing activity of the concrete-operations child is oriented mainly towards real or concrete objects and events in the immediate present; hence the name 'concrete' operations. (For details of the last three stages, see Piaget, 1926; 1928; 1929; 1930; 1950; 1952a; 1952b; Piaget and Inhelder, 1956; Piaget, 1957; Inhelder and Piaget, 1958).

The cognitive structures formed during the concrete and formal operations stages are described as logico-mathematical because Piaget believed that certain logico-mathematical structures make good models of the actual organization and processes in cognitive structures. He sees the two, that is, operational thought and logico-mathematical structures, as having important properties in common. For the concrete-operations stage, Piaget arrived at nine cognitive structures which he called groupings. The grouping is a hybrid of two logico-mathematical structures - the group and the lattice. The nine groupings are viewed as models for cognition in several different realms of intellectual behaviour. They underlie the special abilities like conservation, class inclusion, and coordination of perspectives. Conservation ability, for example, expresses the seventh of the nine groupings which allows for the multiplication of relations. The ability to conserve, therefore, involves basically

the one-to-one multiplication of relations. Class inclusion, on the other hand, is identified with the first of the groupings which allows for the primary addition of classes.

Even though the special abilities and the underlying cognitive structures were believed to be absent before the concrete operations stage, the tasks which are designed to test for their presence are given to preoperational children with the expectation that the children's behaviour on the tasks will throw some light on the changes which make for the important development to operational thinking. The account given by Piaget of the children's behaviour on the tasks is more or less a confirmation of his theory, and we shall illustrate this with reference to the Conservation and Class Inclusion Tasks.

1.2.2 Conservation

The Conservation Task tests for the presence of the ability to conserve quantity, (Piaget, 1952b; Piaget and Inhelder, 1969). This ability is considered to be one of the major requirements of adult reasoning, with various kinds of quantity being conserved; for example, number, length, liquid quantity, weight and area.

The Conservation Task can be seen as consisting of two main parts. To begin with, two equal quantities of material (for example, water in liquid quantity task, thread or thin strips of wood in length task, plasticine in weight or matter task) are presented to the subject. The amounts are made to give the same perceptual impression, and the subject is asked whether the two are equal with respect to their critical attribute. If he makes the correct judgement, the experimenter proceeds to the second part of the test, in which the experimenter transforms one of the two quantities to

create perceptual differences between them. In the number task, for example, the items in one row are moved either further apart from each other or closer together. This transformation creates length and density differences between the two rows.

It is usual for the experimenter explicitly to invite the subject to pay attention to the making of the transformation by saying, 'Now watch what I do'. The transformation is followed by a second request to compare the two quantities.

According to Piaget, conservation in these circumstances requires the individual to coordinate the perceptual differences between the task quantities. In other words, he is required to decentre. The kind of coordination required will necessarily involve making a representation of the problem and mentally reversing the transformation action to return the quantities to the initial correspondence state in thought.

As already indicated, young children commonly give non-conserving responses on the tasks; that is, they change their pre-transformation judgement of the task quantities. (See, for example, Dodwell (1960), Elkind (1961), Hood (1962) and Smedslund (1964).) Piaget took the responses as an indication that the conservation ability is absent from the children. This is a very reasonable deduction in the circumstances, and it was perhaps inevitable that Piaget should see the question of why the children behave as they do as being essentially one of why the ability is absent from them. According to him, they give non-conserving responses because they are not capable of co-ordinating the perceptual differences between the conservation quantities. They are not capable of making the necessary representations and mentally reversing the act of transformation.

Apart from the fact of their failure to give conserving responses,

the nature of the behaviour which young children exhibit on the tasks does help to give the impression that they experience a difficulty with decentring. They appear to be stuck to the perceptual differences between the quantities given. Piaget described this as egocentrism. He judged the children's behaviour to be one of a failure to reason. According to him, rather than considering all the perceptual differences together, the children attend to or centre on the differences separately. This behaviour is believed to result in an impression on their part that the quantities become unequal after transformation; hence, their non-conserving responses. On the number task, for example, they centre either on the difference between the densities of the rows of counters or on the difference between the lengths. On the liquid task, they centre either on the difference between the heights/levels of the quantities of liquid in the containers, or on the difference between the widths/sizes of the containers, or even on the number of containers into which each quantity is poured.

Apparently, the difference centred on at any one moment is the most outstanding or the salient one, and children's judgement of which quantity is more than the other changes as the salient difference changes. It is believed that the children are not aware of a conflict between their judgements, or at least they are not bothered by the conflicts. It is explained that this is made possible by the fact that they actually believe that quantities can increase or decrease even when nothing is added or taken away from them. Piaget explained that conserving responses are given once the conflicts come to be recognized, and when they are resolved by the children's understanding the relationship between the properties or differences centred upon. In other words, conserving responses

are given once the children are able to decentre in their thinking and make a proper representation of the problem. This change makes it possible for them mentally to coordinate the differences and reverse the transformation action to return to the initial correspondence state.

Piaget did consider the possibility that young children give non-conserving responses for reasons other than the one which he proposed. Specifically, he considered the possibility that the children do not understand the conservation question. But, as for the other alternative explanations which he considered, Piaget regarded this as an equivalent explanation. Shown below is a typical comment by him on the matter. The comment was made in the context of a liquid quantity task, and the subjects were 4 and 5 year olds.

> "It might of course be argued that the child may not really have grasped the question. Does he always understand that it refers to the total quantity, or does he think he is merely being asked about changes in the number, level or size of the glasses? But the problem is precisely to discover whether the child is capable of grasping a quantity as being a whole, as a result of the co-ordination of the various relationships he perceives. The fact that these children isolated one of these relationships may therefore be due as much to lack of understanding of the notions in question as to failure to grasp the verbal question."
>
> Piaget, 1952b, p.8-9.

Surely, if grasping the reference of the conservation question is one and the same thing as understanding the notions involved in conservation, then the conservation test is no more than a test of the child's linguistic skill. But knowledge of what the words used in the conservation question denote cannot be a necessary condition for conservation ability. It is only one of the necessary conditions for manifestation of the ability which is a separable issue, and which, when absent, will lead to non-conserving responses in spite of the presence of conservation ability. However, before we pursue our criticism any further, we shall go on to consider the Class Inclusion Test.

1.2.3 Class Inclusion

The Class Inclusion Task tests for the presence of the ability to make the simultaneous comparison of the whole of a class with a part of it (Inhelder and Piaget, 1964; Piaget, 1952b). As for conservation ability, class-inclusion ability is believed to be one of the major requirements for adult thinking.

The material used for the class-inclusion task varies.

Commonly it comprises beads, pictures of flowers and toy animals. Where flowers, for example, are used, the whole class to be compared could be defined by the primary attribute of flowers, while the subclasses are defined by the type attribute or by colour. Where beads are used, the whole class could be defined by the material attribute of wood or glass, and the subclasses by colour or shape. The subclasses are made to be numerically unequal, and often, the numerical difference is varied for the same child over a number of trials.

For descriptive purposes the whole class is often represented by the letter B, and the subclasses by A and A' . The question given demands the subject to compare the size of B with the size of A , the bigger subclass. It is believed that this comparison will entail the simultaneous consideration and coordination of the following two relations (one being the reverse of the other):-

(i) The whole class is made up of the two subclasses; that is, $B = A + A'$,

(ii) The larger subclass (A) is the part of the whole class which is left over when the smaller subclass is subtracted from it; that is, $A = B - A'$.

According to Piaget, it is only through such reasoning that it will be recognized that the whole is greater than either of its parts (or $B > A$). As for the conservation tasks, the subject will need to overcome the influences of perceptual differences. He will need, for example, to ignore the differences between the subclasses to consider the whole class.

Young children commonly fail to give inclusion judgements;

that is, they deny that the whole class is larger than one of the parts. As for the conservation tasks, Piaget took the non-inclusion judgements as an indication that the children do not have the inclusion ability. As for those tasks, therefore, he saw the question of why the children give the judgements as essentially one of why the ability is absent from them. He claimed that even though they know that the whole class is made up of the two subclasses, they forget the whole class as soon as they think of the subclasses. And as soon as they think of the whole class, they forget the subclasses. In other words, they are not able to coordinate the relations between the classes. This is said to be due mainly to an inability to reverse the two relations given above; that is, they cannot reverse $B = A + A'$ to arrive at $A = B - A'$ or reverse $A = B - A'$ to arrive at $B = A + A'$. In one word, the children are not capable of the mental operations required for class inclusion.

Again, as for the conservation tasks, the behaviour exhibited by the children on the Inclusion Task gives an impression that they have a genuine difficulty with decentring or coordinating the necessary relations. On questioning about the task, they commonly state that there are more of the larger subclass than the whole class because there are only a few of the other subclass. This goes to show that what the children compare are the two subclasses, and not the whole class and the larger subclass as directed. In view of the fact that the same children, on being questioned, agree that the whole class is made up of the two subclasses, the behaviour of comparing the subclasses would seem to show that they become attracted to the perceptual attributes which define the subclasses. Piaget took the behaviour to indicate that the children are egocentric; that is, they immediately centre on the perceptual attributes, and he explained

that this behaviour is what makes it impossible for them to achieve the cognitive operations required for success on the task. Again, this explanation implies a failure to reason about the task.

Piaget believed that inclusion judgements are given once children become capable of making a proper representation of the problem, and when they start to decentre in their thinking about the potentialities of the test situation. When this happens, the coordination of the relations which exist between a whole class and its subclasses becomes possible for them. Piaget considered and dismissed the possibility that children's non-inclusion judgements could result from a failure to understand the Inclusion question. For him, the development of the ability to decentre is the only important change which makes for the transition to the concrete-operational stage. Piaget wrote, for example:

> "It might of course be argued that the child's difficulty in mentally constructing two simultaneous sets is not due to the irreversibility of his thought, as we have just suggested, but merely to lack of understanding of his instructions. Might he not think that two necklaces were actually to be made with the same material? It was precisely with this possibility in mind that we finally used two sets of beads in two separate boxes, and as we have seen, this technique made little difference to the result. The difficulty is therefore not due to verbal misunderstanding."
>
> Piaget, 1952b, p.179

(The material referred to in the comment are beads, and in an attempt to make the inclusion question more meaningful, subjects had been told to imagine that necklaces would be made from the beads.)
In another section of the particular chapter from which the above comment is taken, Piaget had written:

> "It thus seems to be the relationship of inclusion that is the stumbling-block for these children. For them, wholes are not logical classes, but elementary schemata of assimilation or syncretic aggregates, in which the relation between the part and the whole is not yet a quantitative relationship, or even 'intensively' quantifiable, i.e. there is neither part nor inclusion, but merely qualitative participation."
>
> Piaget, 1952b, p.171

It is important to note that Piaget was led to present the inclusion task with two sets of beads (first quotation above). According to his own report, young children perform on this version of the task as they do on the original version with one set of beads.[2] The point is that this second task is not an inclusion task. It involves a comparison of non-included sets. This being the case, the fact that children behave on it as they do on the proper inclusion task is an indication that the stumbling-block for this age group on the task may not be the relationship of inclusion.

1.2.4 Language Development and Operational Thinking

Piaget's account of the development of operational thought does not attribute any significant role to language. By suggesting that young children behave as they do on his tasks only because of difficulty with decentring, and never because of difficulty with the test questions, Piaget was in effect suggesting that development in language was not very important for concrete-operational development. This is contrary to what the present alternative claim would suggest, and it is therefore necessary to elaborate on the matter.

Piaget noted that representational thought or symbolic functioning does not begin with and result from the incorporation

of verbal signs from the social environment. The first symbols or signifiers, according to him, are the private, non-verbal symbols which emerge towards the end of the sensorimotor stage, and which come into being through the internalization of imitation in the form of image signifiers. What is suggested is that language behaviour is a dependent variable, with general cognitive development as the independent variable. (See Piaget, 1926, 1951.)

It is not only at the initial stages that Piaget took language to be entirely dependent on general cognitive development, the relationship was believed to persist right up to the concrete operations stage. (See, for example, Inhelder and Piaget, 1964.) Logical operations, he said, result from coordinations among actions and not from language. Piaget would readily agree that language helps to free representation from its reliance on immediate action. He would also agree that language indefinitely extends the power of logical operations, and confers on them a mobility and universality which they would not have otherwise. But he still maintained that right up to the end of the concrete-operations stage, language merely reflects thought. In other words, language depends entirely for its development on the formation of the different cognitive schemata or structures which he postulated. Under such circumstances, it will be inconceivable to regard language as having any significant part to play in development before the formal operations stage.

1.2.5 Genevan Research on the Role of Language and Contrary Evidence

There have been a number of experimental studies, as well as ordinary comparative analyses which support Piaget's position on language. Most of these come from workers in Geneva.

Sinclair (1971), for example, identified some sensorimotor schemes which she felt could account for initial language development. The child's ability to classify in action, for example, was given as being responsible for the later ability to place linguistic elements into the major categories like noun phrase and verb phrase. The ability to relate objects and actions to one another, on the other hand, was given as being responsible for the functional grammatical relations such as 'subject of' and 'object of'.

In addition to the comparative analyses of the nature of early language and sensorimotor structures, Sinclair (1969) also conducted experimental studies of the relationship between language and cognition during the preoperational and concrete operations stages. She compared conserving and non-conserving children on the use and understanding of comparative terms applicable to quantity. These terms are used in Conservation Tasks. She found that the conservers were more likely than the non-conservers to use somewhat more complex comparative terms. This correlation was taken as an indication that the correct use of the terms is closely linked to operational progress.

Sinclair also tried to teach the non-conservers the kinds of comparative expressions which they had not produced previously. This attempt was met with some success, but the coaching was ineffective in bringing about the acquisition of the conservation skills which the children had lacked before it. This result was taken by Sinclair to confirm the independence of logical operations from language development. She wrote, for example,

> "These Genevan results, together with the results of the research on deaf and blind children mentioned earlier, confirm Piaget's view on the role of language in the constitution of intellectual operations: language is not the source of logic, but is on the contrary structured by logic."
>
> Sinclair, 1969, p.325

Piaget too acclaimed these results and wrote that,

> "Linguistic progress is not responsible for logical or operational progress. It is rather the other way round. The logical or operational level is likely to be responsible for a more sophisticated language level."
>
> Piaget, 1972, p.14

Results similar to Sinclair's were obtained by Inhelder (1969), and Ferreiro and Sinclair (1971). The two studies involved the cognitive operation of reversibility. Inhelder's study was concerned with seriation ability - arranging different sized items in increasing or decreasing order and being able to start off the ordering from any one of the items. The ability is believed to depend on the child knowing that any particular one of such items is both bigger (fatter, longer) than some of the other items in the series, and smaller (thinner, shorter) than others. As for Sinclair's study, Inhelder found that only children who had nearly reached the operational stage were able to use the appropriate linguistic terms (comparatives) for describing the relations between the items (sticks) in her series.

While it has not been denied that sensorimotor structures must have some part to play in initial language development, some serious criticisms have been levelled against the Genevan studies of later developments. It has been noted that the conclusions arrived at by Sinclair need not have been drawn from that data. (Fodor, Bever, and Garret, 1974). Another worker with a different view could draw a very different conclusion from the same results.

Other investigators have drawn attention to the fact that Sinclair's conservers were older than her non-conservers. This makes her conclusions doubtful. The difference which she found

between conservers and the non-conservers in the use of complex or appropriate comparative terms may have been due more to age and experience than to the differences in operational level of thinking (Moore and Harris, 1978).

Moreover, the original findings have not always been replicated. To give an example, Moore and Harris (1978) compared children (3 years 5 months to 8 years 11 months) on the ability to reverse relationships in thought about objects and to apply the same operation in language constructions. The Conservation Tasks were used to test the former while the passive construction was used to test the latter. The investigators found a number of non-conserving children who could, however, understand the passive sentence structure.

Scholnick and Adams (1973) also compared children on the same abilities as Moore and Harris (although they used a matrix-permutation task to test reversibility in thought). They did not find many children being capable of reversibility in language before they were able to do so in thought, as did Moore and Harris, but neither did they find the reverse to be true. What is suggested is that there is no conclusive evidence that cognitive developments must precede development of the same abilities in language.

Further important data has come to light which shows Piaget's extreme view to be inaccurate. The evidence is of two main kinds.

The first is the finding that there are developments in language which cannot be attributed to the maturing cognitive processes in any direct manner. The linguistic developments, moreover, do not necessarily serve the child better in saying what he has to say. They are simply more complex than initial forms.

Such a finding was made, for example, for the development of self-reference in a study of pronominalization (formation of pronouns). (Bellugi-Klima, 1969 - cited by Cromer, 1974; and Bellugi, 1971). Furthermore, it has been found that some linguistic structures are not developed for quite some time after the cognitive counterparts have been developed. The language forms resist acquisition because of their grammatical complexity. This is seen to advantage in the case of some bilingual children. Slobin (1973) cites the example of two girls learning both Serbo-Croatian and Hungarian. The Serbo-Croatian expressions for spatial locations are more complex than the Hungarian forms. It was found for the girls in question that they were able to express the concepts in Hungarian before they were able to do so in Serbo-Croatian. The fact that the concepts were expressed at all in one language was an indication that they were already developed in the children's thinking. The fact that they were not expressed in the other language indicated that linguistic structures may resist acquisition in spite of appropriate cognitive gains.

The second type of evidence in conflict with Piaget's concept of cognitive primacy relative to language concerns the very early stages of development. Studies of pre-linguistic communication, analysing data from mother-infant interaction sessions at home or in the laboratory, have revealed that many skills of communication are mastered by the child in the pre-linguistic period which are necessary for later language development. Essentially, the infant learns many non-linguistic conventions about the appropriate use of words.

The studies, like the claim of this thesis, are animated by

the view that language is a tool which we use to do things and to cooperate in doing them. We use language to communicate purposes and to share knowledge. As we noted at the beginning of the chapter, and as the account of his theory of development makes clear, Piaget views language essentially as a symbolic system for representing knowledge. While this is one very important function of language, a neglect of the other communicative functions leads, according to the alternative approach, to a distorted view about how the child initially understands or uses language.

The important evidence from the above studies of early communication is that even at the very beginning, development of functions of language is not entirely dependent on the prior formation of a general symbolic function. The pre-linguistic child is learning to communicate and to share knowledge well before he begins to master language. He already communicates by non-verbal means. When he begins to use language proper, therefore, he has already mastered several aspects of what language is used to do.

Many of the investigators of pre-linguistic communication emphasize the fact that the pre-linguistic developments described will be impossible without the child's active interaction with the mother or other caretaker. This is not something which Piaget's account of initial development would lead one to expect. Piaget emphasizes the role of the coordination and internalization by the child alone of many different action schemes which contribute to the development of a general symbolic function. Furthermore, the action schemes described by Piaget are directed more towards impersonal objects and less toward other people.[3]

In addition to the fact that the kind of developments described depend essentially on the child's interaction with other persons, they also seem to express a kind of innate willingness on the part of the child to master such activities. (For details of the evidence concerning the communicative abilities of infants, see the following - Trevarthen, 1974, 1977, 1979a, 1979b, 1980; Bruner, 1975a, 1975b, 1978a, 1978b; Ninio and Bruner, 1978; Ryan, 1973, 1974; Bates, 1976; Snow, 1978, Lieven, 1978, Ryan, 1978).

The important implication of the evidence concerning the relative independence of language, both at the very beginning and in later development, is that, contrary to Piaget's view, failure on his concrete-operations tests may be brought about by failure to understand the questions given.[4] Furthermore, it is necessary to be more specific about what we mean by 'understanding' test questions. There are two senses in which one may understand a sentence. One may know what the words of the sentence denote or one may grasp the message which a speaker uses the sentence to convey. Under normal circumstances, we are interested in the message of a sentence spoken by another person and this is true of test situations as well. However, knowledge of linguistic sentence meaning, while essential, is not sufficient condition for grasping the message of an utterance. In fact, failure in grasping speech messages is quite common and there is no reason why it should be ruled out for Piagetian tests. To fully appreciate how this failure may occur we must consider in detail how language functions as communication.

1.3.1 The Communicational Approach to Language - Speech Act Theory

As already indicated, this approach has it that we use language to do things; hence the term 'Speech Act'. We use language to

communicate purposes to each other. The same sentence may be used to signify different wishes or inclinations in different contexts. Our understanding of sentences in communication situations is, therefore, sensitive to the contexts in which they are spoken.

An interest in the concept of speech acts necessarily involves the researcher in an attempt to specify those aspects of speech contexts or situations which may influence the achievement of different kinds of communication.

In general, such contextual aspects may be placed in three broad categories: (1) linguistic, (2) paralinguistic, and (3) extralinguistic.

Aspects of the linguistic context of an utterance include the intonation pattern and the amount of stress placed on the different words. The sentences spoken prior to the particular sentence to be interpreted together with their intonation and stress patterns also form part of the linguistic context.

The aspects of speech contexts commonly described as paralinguistic include level or loudness of voice, gestures, head-nods, facial expressions, eye-movements, the angle at which people sit or stand in relation to each other (orientation), posture, age, sex, appearance and level of authority of speaker.[5]

The extralinguistic aspects of the context of an utterance are the impersonal physical aspects. These include the characteristics of objects present and/or referred to; for example, the shapes, sizes and colours. Also included is the arrangement or relations between the objects; the nature, order and intensity of any events affecting the objects.

Speech situations differ in the extent to which they involve the different aspects listed above. One kind of situation in which many of the aspects come into force is where the participants have

physical views of each other and the objects and events being discussed are physically present. This kind of interaction is commonly referred to as face-to-face conversation and may be compared with a telephone conversation which does not concern any real objects and events. In this latter case, paralinguistic and extralinguistic features play a considerably reduced role in the interpretation of messages. With regard to a telephone conversation concerning real objects and events, extralinguistic features play an important role but a lot is left to the imagination and the past experiences of the listener. He is left to construct the extralinguistic context (if not the paralinguistic context as well) in his head. The same can be said for a face-to-face interaction where the objects and events discussed are not present.

The past experiences of the listener (and, therefore, the concepts which he has developed about the nature of the world), are no less important in determining the message deduced in those circumstances where the objects and events discussed are physically present. The assumptions which the listener makes about them are partly dependent on such experiences. This is a most important point to bear in mind, and it accounts for the relative consistency in the individual's interpretative structuring of different situations during a particular period of his development. See, for example, Bruner, Goodnow and Austin (1956).

Having considered in a very general manner the communicational approach to language, as well as the contextual factors which

influence the comprehension of messages, we should give some account of proposals which first introduced the approach in the philosophy of language. The particular works which have been chosen for discussion are those by Austin (1962) and Grice (1957, 1968).

1.3.2 Austin

Austin (1962) attacked an established assumption in philosophy that to say something is always and simply to state something. He pointed to cases where this assumption was false and he suggested instead that very often, to say something is to do something; that is, one performs an act by speaking in that way.

Utterances of this kind were described by Austin as performatives, and were contrasted at first with utterances which were supposed to be mere statements or descriptions; that is, constatives.

Among the examples of performatives, Austin gave the following two utterances:

'I name this ship the Queen Elizabeth'

'I bet you sixpence it will rain tomorrow'.

The individual who makes the second utterance, for example, is not just making a statement or emitting words, he enters into an agreement with his listener.

Austin went on to note that the speaker may not always succeed in achieving the action which he tries to perform with his utterance. To quote him on the matter, he wrote that:

> "Besides the uttering of the words of the so-called performative, a good many other things have as a general rule to be right and to go right if we are to be said to have happily brought off our action."
>
> (my underlining) Austin, 1962, p.14

According to Austin, the circumstances of the performative

utterance have to be appropriate to its making. The person who says 'I name this ship the Queen Elizabeth', for example, could only actually (or in deed) have named the ship if (among other things) he is the person appointed to name her. For the person who says 'I bet you sixpence it will rain tomorrow', the bet only takes effect if the rules which govern betting are complied with.

Another example given by Austin is the utterance 'I give it (a gift) to you'. When someone says this, but does not hand over anything or make arrangements to do so, he does not effectively give a gift.

When the circumstances of an utterance are not appropriate to its making, the speaker can only be said to have said something. He cannot be said to have done something in saying what he said.

Austin then went on to consider some of the factors which may have to be satisfied for the happy consummation of performative utterances in general. The list given by him is reproduced below.

(A.1) There must exist an accepted conventional procedure having a certain conventional effect, that procedure to include the uttering of certain words by certain persons in certain circumstances, and further,

(A.2) the particular persons and circumstances in a given case must be appropriate for the invocation of the particular procedure invoked.

(B.1) The prodecure must be executed by all participants both correctly and

(B.2) completely.

(T.1) Where, as often, the procedure is designed for use by persons having certain thoughts or feelings, or for the

inauguration of certain consequential conduct on the part of any participant, then a person participating in and so invoking the procedure must in fact have those thoughts or feelings, and the participants must intend so to conduct themselves, and further

(T.2) must actually so conduct themselves subsequently.

Austin's proposal took a very important turn when he abandoned the distinction between performatives and constatives. He recognized soon enough that the making of a statement itself is an act, and any statement can actually be judged on the same criteria which he had listed for the so-called performatives; that is, appropriateness of context or circumstances. Also, the so-called performatives can be judged as true or false. These are criteria which he initially considered as relevant only to the so-called constatives.

Austin consequently turned his attention to the question of the different senses of 'doing something' by any statement. The act of saying in itself was dubbed 'locutionary act'. The different acts which may be performed as a result of saying things were described as 'illocutionary acts'. These illocutionary acts include the following:

asking or answering a question,
giving some information or an assurance or a warning,
announcing a verdict or an intention,
pronouncing a sentence,
making an appointment or an appeal or a criticism,
making an identification or giving a description.

In addition to the distinction between locutionary and illocutionary acts, Austin also distinguished between the illocutionary force of an utterance and its meaning. Behind this distinction is the observation that the same utterance may be used in different ways on different occasions. One of the examples given by Austin is the utterance 'It is going to charge'. Where explosives are concerned, for example, it will make a big difference for the listener whether the utterance is a warning or whether it is merely information (that is, it will charge and go off sometime, but not now).

As for illocutionary acts in general, illocutionary forces are determined in part by the circumstances in which they are exerted. The example given above can be used to illustrate this.

As may be expected, there has been some controversy over the accuracy of Austin's analyses. (See, for example, Searle, 1968). However, the basic notions have been well received. These, in summary, are that there is more to speech than the mere utterance of linguistic units with factual import. Apart from the ordinary meaning of an utterance, there is what we do in making the utterance. Also, the acts which we perform in making utterances are partly dependent on the circumstances which surround them.

1.3.3 Grice

Grice (1957, 1968) considered it necessary to distinguish between two notions of meaning.

The first one involves specifying what someone means by making an utterance x , and it was called occasion-meaning.

The second notion of meaning involves specifying what an utterance X means. This was called timeless - meaning.

As regards occasion meaning, Grice did not restrict the term

'utterance' to speech alone. X could be an action, for example. What is important is for x to mean something.

Grice tried to account for occasion meaning by means of a complex interaction of intentions on the part of both the speaker and the listener. Specifically, someone, U , means something by an utterance x , if by the utterance he,

i_1) intends to produce in A (listener) a certain response, r , and

i_2) intends that A shall recognize his intention i_1 , and

i_3) intends that this recognition on the part of A shall function as A's reason (or part of his reason) for the response, r .

The intentions considered are factors outside the utterance x itself, and one can only expect that a speaker may have to employ contextual aids (linguistic and non-linguistic) to make the intentions known.

According to Grice, without the proposed intentions (explicit or implicit), someone cannot be given to mean something by uttering something.

The analysis has come under attack from other workers. Some have merely added conditions to those given by Grice. Strawson (1964), for example, suggested that in addition to the above three intentions, someone, U , should i_4) intend that A should recognise his intention (i_2) that A shall recognize his intention ^1i .

However, other workers have characterized the whole account as grossly misleading. (Ziff, 1971). The main point of this criticism is that the theory or analysis fails to take account of

all instances of meaning. Some or all of the intentions specified by Grice and Strawson may not be recognized, and yet someone might still be taken by a listener to mean something. (And such meaning need in no way be equivalent to specifying what the utterance means in a strictly linguistic sense.)

Grice, of course, did not completely disregard the possibility that some of the intentions which he postulated may not always be recognized. However, he did not grant that someone can be taken by a listener to mean something in such circumstances. Here is what he had to say on the matter. (A here is the speaker.)

> "Perhaps we may sum up what is necessary for A to mean something by x as follows: A must intend to induce by x a belief in an audience, and he must also intend his utterance to be recognized as so intended. But these intentions are not independent; the recognition is intended by A to play its part in inducing the belief, and if it does not do so something will have gone wrong with the fulfilment of A's intentions. Moreover, A's intending that the recognition should play this part implies, I think, that he assumes that there is some chance that it will in fact play this part, that he does not regard it as a foregone conclusion that the belief will be induced in the audience whether or not the intention behind the utterance is recognized."
>
> (my underlining) Grice, 1957, p.383-384

Whatever criticisms are levelled against Grice's account, one cannot dismiss his principal claim: the meaning which the individual gives to an utterance in a communication situation is greatly influenced by factors other than its language.

Proposals such as the two which have been discussed have had a widespread and profound effect on the thinking in several areas of psychology and linguistics.

We already mentioned the work being done on pre-linguistic

communication. This has been considerably influenced by the ideas of the 'Speech Act' philosophers.

The theory of grammar has been similarly affected. Chomsky (1957, 1965) had proposed that the structural basis of grammar was strictly syntactic. However, following the above proposals concerning the functions of language, other investigators began to consider that grammar may have a more appropriate basis. It was argued that the basis of grammar should, instead, be semantic; that is, based on the meaning of words. (See Schlesinger, 1971a, 1971b; Fillmore, 1968; McCawley, 1968.) Furthermore, many of the factors now judged to be important for grammatical decisions are actually factors external to the particular utterances used as examples. (For some interesting arguments, see Ziff, 1965; Olson, 1970; Lakoff, 1971; and Osgood, 1971.)

1.4 Literal and Non-Literal Interpretations of Communicative Intent

There are at least two ways in which the listener may go about deriving a speaker's meaning for an utterance. He may construct the meaning primarily on the basis of what the words of the utterance denote (that is, linguistic sentence meaning), and only secondarily on the basis of the context of utterance. Alternatively, the listener may construct a speaker's meaning primarily on the basis of the context of utterance. The former meaning is what is commonly referred to as literal interpretation while the latter is referred to as non-literal interpretation.

In those circumstances where there is a significant correspondence between the linguistic sentence meaning of an utterance and its perceived context, there cannot be any significant difference between the literal and non-literal interpretations of what the speaker means

by the utterance. Furthermore, the non-literal interpretation, like the literal interpretation, will be consistent with the linguistic sentence meaning of the utterance. Let us consider as example, the sentence

'Eat up the rest of the biscuits'

spoken in a situation where the speaker actually proffers the plate of biscuits from which he and the listener had been eating. It will not matter greatly whether the speaker's meaning is constructed primarily on the basis of what the entire context suggests or on the basis of the linguistic sentence meaning.

In the circumstances where there is little correspondence between the linguistic sentence meaning of an utterance and its context, however, one will find a large discrepancy between the literal and non-literal interpretations of a speaker's meaning. In order to construct a non-literal interpretation in such instances the listener assumes a correspondence between sentence and context, and the interpretation lacks consistency with the linguistic sentence meaning. To construct a literal interpretation, on the other hand, the listener imagines a context which corresponds with what the sentence means.

To illustrate the point which we are trying to make, let us consider the sentence

'Could you hand me the rest of the dogs?'

spoken by a mother to her onlooking child while she (the mother) is engaged in the task of gathering and counting forks in the kitchen. (Let us assume the family possesses a number of dogs). The immediate context quite clearly suggests that what the mother wants are forks (this will be expecially the case where there had been no mention of dogs either by the mother or the child in their preceding

conversation). Giving a non-literal interpretation to the mother's request, therefore, the child will be prompted to hand her some forks. Where a literal interpretation is given, on the other hand, dogs, rather than forks, will be sought and handed over.

The main point which we wish to make in drawing the distinction between literal and non-literal messages is that what we tend to give when we hear utterances is what has been described as non-literal interpretation; that is, on top of the fact that we strive to deduce the message which a speaker intends to convey by a sentence spoken in a particular context, we commonly give considerable weight to what the context of utterance suggests about a speaker's message; at least, so long as this makes good sense or conforms with real life experience.

An extreme example is found in the case of metaphors and jokes. Here the presuppositions expressed are literally impossible.

'She is a real gem'

'She is a cow'

In most other cases where we give non-literal interpretations to utterances it is not that the presuppositions expressed are literally impossible. In other cases literal interpretations are not considered (or are not available) because the presupposition is unlikely. Consider the sentence

'David is mad'

spoken in a situation where David has been having a serious argument with Paul who is absolutely drunk. (The utterance is not from Paul). Mental illness is not common enough for a listener to give a literal meaning to this statement. The utterance will instead be taken to mean that David is being unreasonable or impossible.

It can be argued for many utterances in ordinary conversations

that the listener is almost invited to give considerable weight to context. Relevant pieces of information are left out of the utterances themselves (Lyons, 1972). This practice is most outstanding in face-to-face interactions where the objects and events being talked about are physically present.

Formal test situations in general and Piaget's concrete-operations tests in particular, resemble everyday communication situations in certain important respects. However, this notwithstanding, some of the demands made in tests are quite unlike those that arise in everyday speech life. The one which is of interest here is the implicit requirement that subjects interpret the questions put to them as literally as possible, and even when the non-literal alternatives are no less likely.

However, it is one thing for tests to make such a demand, and quite another for all subjects to meet it. Young children in particular may fail to meet the test demand. They may give, instead, interpretations which are constructed primarily on the basis of context.

It follows that in circumstances where there is little correspondence between the literal and the non-literal interpretation of a test question, young children may fail merely because of a preference for making an interpretation mainly based on contexts.

A similar explanation has been suggested to explain failure of children's performance in both the Conservation and Class Inclusion Tests of Piaget.[6] In the original account given by McGarrigle and his colleagues, no distinction was made between literal and non-literal interpretations of utterances. Only one kind of speaker's meaning was considered, and this was contrasted with linguistic sentence meaning. The latter was represented as the desired interpretation of test

questions and as what older subjects prefer to give. Presented below are some of Donaldson's (1978) supporting remarks about this account -

> "Leaving explanation aside, what actually happens when a 'non-conserving' response occurs? It amounts to this: in a short space of time, the child gives two conflicting answers to what, for an adult, is the same question with 'the same meaning'. But suppose that the child is not concerned to weigh specially what the words of the question mean in isolation. Suppose he is rather interpreting the whole situation: what the experimenter says, what he does, what he may reasonably be thought to intend."
>
> Donaldson, 1978, pp. 62-63 (my underlining)

> "One way to describe the difference between child and adult would then be to say that it lies in the amount of weight that is given to sheer linguistic form. The question seems to be whether the meaning of the language carries enough weight to over-ride the meaning of the situation. Does the language have priority? Can it over-ride reasonable expectation?
>
> Donaldson, 1978, p. 63 (my underlining)

It can be argued that even though the older subject may not interpret Piagetian test questions in the same manner as the young child, he must, like the child, be aware of the meaning of the immediate physical situations. To this extent, the older subject does not interpret the words of the questions in isolation as implied by Donaldson.

A stronger and more important objection to Donaldson's account concerns the fact that there are a number of words which cannot be given a meaning in isolation and can only be interpreted within a particular context. The words in question include I, you, he, she, we, they, them, this, that, here, there (commonly referred to as 'deictics'), and the definite article 'the'.

Let us consider as example the following utterance

'She will be arriving soon'

A listener will not be able to identify the referent of the term 'she' unless something had been said or done in the immediately preceding context about a particular female. The speaker might have shown a photograph of his mother or girlfriend, for example, or he might have said something about such individuals in which they were more or less named.

This same condition holds for the identification of the referent in the following utterance.

'The lady will be arriving soon'

Some of the expressions used in the concrete-operations tests may be placed in the same category with the ones mentioned above. The quantitative term 'more' used in both the Conservation and Class Inclusion questions is a very good example. Consider the utterance

'I shall add some more'

A listener will only be able to identify what the speaker means to add by searching the context of utterance. Furthermore, the same term is used to speak of various kinds of quantity (length, volume, number, density, height, diameter, temperature, pressure, to name a few). Consider the utterance

'One has more than the other'

spoken where amounts of mercury placed in identical beakers are being compared in a chemistry laboratory. Mercury is one of those liquids which expand on being heated. The quantities under comparison may differ, not only in the heights reached in the beakers, but also in the temperatures to which they are heated. However, unless the quantities are of the same volume, the higher-reaching amount may not be the one with the higher temperature. It will be left to the context of utterance to determine what kind of quantity the

speaker has in mind.

However, it is necessary for the cases which we have been describing to distinguish between the linguistic context on the one hand, and the extralinguistic and paralinguistic context on the other. This is because linguists make a distinction (particularly when discussing the definite article) between identifying a referent from one or the other context. Identification made by reference to the previous linguistic context is described as anaphoric, while identification made from the paralinguistic or extralinguistic context is described as exophoric.

Situations of course differ with respect to where a listener may locate the intended referent of these special terms. In some cases, the necessary information will be contained in both the speaker's previous utterances and in the paralinguistic/extralinguistic context. Provided that the information from the two sources are identical, the listener will not experience any difficulties in such circumstances. However, it is possible to have a situation where different potential referents are indicated. In such circumstances, a listener must choose one of the two possibilities.

Let us consider again the utterance

'She will be arriving soon'

made where the speaker has just said something about his mother and has also presented a photograph of his girlfriend. There is little to help a listener decide which of the two females the speaker means. He is just as likely to be referring to the mother as to the girlfriend and he cannot be referring to them both. One may describe the circumstances as one where the potential referents are incompatible. The speaker's mother and his girlfriend cannot be one and the same

person.

In some other circumstances, the referents indicated by the linguistic and paralinguistic/extralinguistic context may be different but they may be compatible; thus allowing a listener to consider both as being intended instead of choosing between them. Let us use here the example of the utterance

'One has more than the other'

made where the speaker has just said something about the heights reached by amounts of mercury and has also taken their temperatures.

In the circumstances described above, one may consider a listener who chooses a speech-indicated referent as giving a more literal interpretation. On the other hand, a listener who chooses the referent indicated in the paralinguistic/extralinguistic context alone (or this together with the speech-indicated referent where possible) may be considered as giving a more non-literal interpretation.

Piaget's Conservation and Class Inclusion tests may be seen as presenting subjects with this particular kind of choice. (See section 2.5).

It is worth noting here the claim that children master exophoric reference before they do anaphoric reference. Specifically, anaphoric reference is said to be beyond the child until he is about 8 years. (Warden, 1976; Karmiloff-Smith, 1979). This claim may be taken by us as a suggestion that young children will not give literal interpretation to utterances even where such interpretation is reasonable. At the very least, the claim may be taken to mean that where there exists a choice of potential referents, young children will give that which is indicated by the paralinguistic/

extralinguistic context. Hoever, some writers have claimed that young children are quite capable of managing anaphoric reference (Maratsos, 1976). The lack of agreement between results may arise from the differences between the situations in which comprehension is assessed.

We shall be using the term 'Situational' interpretation to refer to what has been described here as non-literal interpretation. The purpose of the alternative term is simply to draw attention to the heavy reliance on extralinguistic and paralinguistic contexts for such interpretation. Literal interpretations, we must repeat, are similarly derived partly from such contexts, only to a reduced extent.

So far, no suggestion has been made as to why young children should give only situational interpretations. It is clear from the definition given at the beginning of this section that the construction of literal interpreations must place a greater cognitive demand on the individual than the construction of situational interpretations. However, it is also clear that the level of demand made by literal interpretations will vary for different situations and for different sentence meanings. At one end of the continuum we have those circumstances where there is little correspondence between the linguistic sentence meaning of an utterance and what we know to obtain in real life; that is, the presupposition expressed describes an impossible state-of-affairs (cases of jokes or metaphor). Closely following in order of decreasing complexity are circumstances where the presupposition expressed by a sentence describes a possible state-of-affairs, but there is little correspondence between linguistic sentence meaning and the immediate context ('Could you hand me the rest of the dogs').

At the other end of the continuum we have those circumstances where there is almost perfect correspondence between sentence meaning

and immediate context ('Eat up the rest of the biscuits'). Obviously the cognitive demand in this last case is only minimal. The listener does not have to undertake the task of visualizing a context which corresponds with the meaning of the sentence given. Those circumstances where the listener has to identify the intended referent of an expression from its context cannot be placed at the more complex end of the continuum either. The context which the listener has to analyse is real and immediate, or at least very recent. Even when a listener fails to identify a referent in the linguistic context as intended by the speaker, therefore, (or where the listener goes by what the paralinguistic/extralinguistic context suggests), there will be little necessity for us to appeal to any complex cognitive deficiency for an explanation. Perhaps an explanation for this can be found by considering circumstances of language acquisition.

Since the Piagetian tests which we are considering fall into this last category of circumstances, we shall not be asking whether young children might not be capable of literal interpretations as such or whether they lack the necessary cognitive requirements. It will be more reasonable to consider simply that the children attach more weight to what situations suggest about the intended messages of utterances than others do.

It has been claimed that children depend on their sensitivity to social situations for the development of language and for responding to language in a general sense. Such common dependence on situations could make it difficult for a young child to reduce the weight given to the situation of utterances when interpreting them. In the next chapter, we shall examine these claims.

CHAPTER 2

Sensitivity to Situations and its Contribution to the Development and Use of Language by Young Children

2.1 Introduction

This chapter is concerned with the claims that children depend on their sensitivity to social situations for the development and use of language. We shall consider first the claim about the development of language. According to this claim, the child interprets utterance situations (making use of non-linguistic clues which are paralinguistic and/or extralinguistic in nature) to deduce the message which an utterance is intended to communicate. The message arrived at in this way is then used to work out the linguistic meaning of the utterance. This process is commonly referred to as 'matching'.

It is a well recognized fact that in most cases, adult-infant interaction situations are conducive to such matching. The mother (or other adult) tends to talk to the child about real and immediate situations. This can sometimes take the form of great redundancy as far as the mother's utterances are concerned. For example, when obviously preparing the child's food, the mother will be more likely to say things like, 'Food' or 'Milk' or 'I am preparing your food/milk' or 'Your food will soon be ready'. (This redundant nature of the mother's utterances vis a vis the actions she is performing has been pointed out by Huttenlocher, 1974, among others.) It is almost as if the mother has an innate awareness of the child's techniques for learning language and she wants to play her part in ensuring that the learning takes place.

Not only does the mother make utterances about on-going events, she also uses simple and correct grammar in talking to the child

(Brown and Bellugi, 1964; Phillips, 1973). Such simplicity and correctness will no doubt make it even easier to match linguistic expressions onto non-linguistically derived concepts.

It is not the case that investigators who favour the above claim consider that the ability to interpret situations appears de novo in the very young child. It is believed that the ability partly depends on the long-term development of ideas about the environment and most investigators combine a study of the matching with a study of the development of the non-linguistic concepts or ideas. We shall now consider some of the relevant proposals.

2.2 Proposals about the Role of Non-Linguistic Concepts in Language Development

Proposals about the role of the non-linguistic concepts in language development are not new. Commenting on some earlier claims that the very young child uses the same word to refer to several different things, and that single words are used as if they were complete sentences, Grace De Laguna wrote in 1927:

> "A child's word does not, as we have seen, designate an object or a property or an act; rather it signifies loosely and vaguely the object together with its interesting properties and the acts with which it is commonly associated in the life of the child. The emphasis may be now on one, now on another, of these aspects, according to the exigencies of the occasion on which it is used. Just because the terms of the child's language are in themselves indefinite, it is left to the particular setting and context to determine the specific meaning for each occasion. In order to understand what the baby is saying you must see what the baby is doing. The simple sentence-word is a complete proclamation or command or question, because the speech in which it occurs is so closely bound up with the attitude of response to his immediate surroundings. The independence of the primitive word with respect to other words is paid for by its dependence on the practical situation."
>
> De Laguna, 1927, p.90-91.

Other investigators who held views similar to De Laguna were Guillaume (1973- First published in French in 1927), and Leopold (1949).

Bloom (1970, 1973) was among the first investigators to return to this way of considering early language in recent years. Her first study was concerned with development at the stage when the child begins to put at least two words together. The second study turned attention to development before this stage. What Bloom did was to record the utterances of a few children together with the

descriptions of the situations accompanying the utterances. This was done at regular intervals over a period of time allowing for developments in both the child's non-linguistic concepts and his linguistic expressions to be observed.

On analysing her data, Bloom found ample evidence that her children engaged in very active and relatively advanced interpretive structuring of the interactive situations in which they found themselves. Furthermore, the grammatical functions which the children came to express in their speech were those which they had already developed non-linguistically. Among the concepts for which this development was observed are possession and negation.

Bloom was moved to write:

> " - children perceive and organize their experience of the world in the first two years in terms of certain conceptual representations that are not linguistic. Sometime during the second year, the child begins to discover aspects of the linguistic code that, in the language of his environment can represent certain conceptions of experience. It is proposed that before the use of syntax in their speech, children have little if any knowledge of linguistic structure, and that children learn syntax as a mapping or coding of their underlying cognitive representations."
>
> Bloom, 1973, p. 20.

One of the boldest statements of the proposal that the child interprets situations to decipher language came from Macnamara (1972). According to Macnamara, what several words, syntactic structures and sounds denote can be discovered through this technique. Later, Macnamara (1977) tried to conduct an experimental investigation of the child's judgement of communicative situations. To give an example of the tasks which were administered: the experimenter took a shoe in one hand, and a spoon in the other. While holding out the shoe to

the child who sits by the mother, the experimenter said, "Show me the spoon, Harry." On other occasions the requests made were congruent with the gestures made ("Show me the shoe, Harry"; when holding out the shoe, or "Show me the spoon, Harry"; when holding out the spoon). Other variations included omission of the child's name from the verbal requests, and, also, directing gaze at the mother while addressing the child.

The children in the study were aged between 12 and 17 months. Macnamara found that the clues which are interpreted include objects which are present, the movement of objects, human gestures and eye-to-eye contact. These are very much the same as older children and adults employ in everyday situations, and they presuppose considerable consciousness of human feelings, purposes and cooperative relations. (Greenfield and Smith (1976) have also made a very important study of the non-linguistic clues which the child at the one-word stage employs to interpret communicative situations. Some of the types of clues examined were intonation, gesture, action, and visual attention.)

Most other investigators lay emphasis on the prior development of the non-linguistic concepts which enable the child to make sense of particular communicative situations. Slobin (1973) and Nelson (1973), for example, asserted that many linguistic forms cannot appear in the child's speech until he has developed the appropriate non-linguistic concepts. As Nelson put it -

> "The child then must have an existing schema or concept in order to learn a word that applies to it. If the words that the parents use do not apply to the domain of the schemata that the child has constructed, those words will not be learned."
>
> Nelson, 1973, p. 98.

More recently, Nelson wrote that -

> "To understand the acquisition of linguistic terms and their meanings we must understand the conceptual development process and how it interacts with language learning."
>
> Nelson, 1977, p. 134.

(See, also, Nelson, 1974).

At the same time as he emphasized the prior existence of appropriate non-linguistic concepts, Slobin also emphasized the role of formal linguistic complexity in the development of language. He noted that some linguistic forms do not appear in the child's speech even though he is already capable of the ideas which they represent.

It is not only for the purposes of deciphering language that the child interprets communicative situations. He does so also for the purpose of successful responding to linguistic expressions of which he has only partial knowledge. In this instance, what the child tries to derive from the situation is a technique to supplement his limited linguistic knowledge. Such technique is commonly referred to as rule or strategy.

In the studies which investigate these non-linguistic strategies, the investigator begins by picking a linguistic expression of which the children of a particular age group are known to lack adequate understanding. A situation is then contrived for presenting the expression. This situation will be such that it will be possible to find out whether the children indulge in the use of non-linguistic strategies when responding to the particular expression. The investigator then tries to work out the kind of strategies from the responses given. Usually, the studies involve children of a relatively wide age range. This permits the identification of any changes which might take place in the non-linguistic strategies employed as development proceeds.

2.3 Proposals about the Role of Non-Linguistic Strategies in Language Use

One of the earliest proposals about children's use of non-linguistic strategies came from Clark (1973). Clark's study was concerned with the comprehension of the locative prepositions, 'in', 'on', and 'under'. The children were aged 1 year and 6 months to 5 years. They were required to put small toy animals in, on, and under some reference points which were a box, a tunnel, a truck, a crib, a bridge and a table. Each of these reference points allow two of the spatial relations in question; thereby making possible an incorrect response as well as a correct one. The tunnel, for example, allows for an object to be placed in or on it; the truck allows for in or under; and the table allows for on or under.

The instructions given were of the form, 'Put x in (on, under) the y '. There were eight instructions each for the three prepositions, each preposition occurring twice with each of the four reference points that allowed the relation (in, for example, occurred twice each with the box, the tunnel, the truck and the crib.)

Clark obtained results which would ordinarily suggest that her children had a good understanding of in, an intermediate understanding of on, and a very poor understanding of under. This was particularly true for the youngest children tested. The pattern of the results, however, led Clark to postulate the use of non-linguistic strategies by the children. She noted that when the reference point was a container (box, tunnel, truck or crib), the youngest subjects treated all the instructions as if they involved 'in'. When the reference point was not a container, but had a supporting surface (bridge and table), the children treated all the instructions as if they involved 'on'. Consequently, Clark postulated the existence of the following strategies:-

1. If the reference point is a container, x is inside it.
2. If the reference point has a horizontal surface, x is on it.

According to Clark, these non-linguistic strategies or rules interact with the child's relatively undeveloped linguistic semantic knowledge about the meaning of the locative prepositions. The behaviour of Clark's children also gave her the impression that the non-linguistic rules are strictly ordered in the sense that the first rule is always applied. The second one is applied only

if the first fails. The application of these rules, and in the particular order, helped to give an impression that the children knew the meaning of 'in' and lacked that of 'under'.

Clark also suggested the use of non-linguistic strategies to explain the results which had been obtained by others for children's understanding of relational terms like 'more', 'less', 'same', and 'different'. (Donaldson and Balfour, 1968; Donaldson and Wales, 1970; Palermo, 1973). In these studies, children had been shown to interpret 'less' as if it meant 'more', and 'different' was interpreted as if it meant the 'same'. The results had been interpreted at the time by many investigators, including Clark, only in terms of the child's linguistic hypotheses about the meanings of the expressions.[7]

However, with regard to 'more' and 'less', for example, Clark (1973) suggested that instead of assuming as before that the two terms are synonymous for the child, with 'less' carrying the meaning of an understood 'more', one could suppose that both word meanings are actually incomplete, and that the child's responses are based on the partial meaning which he has for both 'more' and 'less', together with his application of certain non-linguistic strategies for understanding what his interlocutor wishes him to do. (See, also, Clark, 1975). The particular strategy which she suggested is one of usually choosing the greater of two or more amounts or choosing the more extended object on a dimension such as length or height. This strategy was supposed to be used together with a partial semantic knowledge of the language terms. According to Clark, the behaviour of the children in Donaldson and Wales' study indicates that they knew at least that 'more' and 'less' refer to amount.

As the accounts given indicate, for Clark, the non-linguistic strategies employed by the young child derived essentially from his percepts. With regard to the understanding of locative prepositions, for example, she gave that her younger subjects were guided by their knowledge of the reference points. Clark later modified her account to give that the strategies derive from the child's concepts. However, this was not before she was criticized by other investigators. (For the modified account, see Clark, 1975, 1977, for example.) Apart from questioning the basis of the strategies postulated by Clark, the generality of the specific ones inferred by her was also questioned. It was reasoned that the strategies might have been inferred essentially because of the nature of the objects used in the studies and/or because of the limited range of response alternatives provided in them. The results of new studies upheld these criticisms.

One study which tested the understanding of 'less' was carried out by Wannemacher and Ryan (1978). The authors designed various tasks which allowed for a wider range of response alternatives to the language term. The children tested were 3 to 5 years old. In one of the tasks, two girl dolls (identical except for the length of hair) were shown to the child. He was then given the following instruction: "These two girls are twins. There is only one way to know which doll is Susie and which doll is Jane. Susie has less hair than Jane. Which doll is Susie?"

Unlike the results of Donaldson and Wales (1970), Wannemacher and Ryan found little evidence to suggest that young children confuse 'less' with 'more'. (See, also, Brewer and Stone, 1975; and Carey, 1978.) Furthermore, for most of the tasks, the

4 and 5 year olds behaved as if they understood the meaning of 'less', while the 3 year olds behaved at chance level. The particular strategy proposed by Clark for the understanding of the term cannot be used to explain these results. What the results suggested was that, contrary to Clark's initial theorizing, the young child's non-linguistic strategies for the comprehension of 'less' and 'more' cannot be based on mere perceptions of isolated objects or events in the situations in which the terms are used. The child must be taking several factors into account at any one time. (Similar results to Wannemacher and Ryan's were obtained for 'same' and 'different' by Glucksberg, Hay and Danks, 1976).

Wilcox and Palermo (1975), on their part, carried out a further investigation of children's understanding of 'in', 'on' and 'under'. Their study was similar to Clark's but different pairs of materials were used - teapot/table; boat/bridge; road/truck; block/neutral figure. The neutral figure was such that it could take the block 'in', 'on' or 'under' it. The first three pairs of materials were each used twice while the fourth was used thrice. The tasks or instructions were characterized as being either contextually congruent or contextually incongruent. In the contextually congruent tasks the relationships described in the instructions were the normal ones which existed between the object-pairs in real life situations. In the contextually incongruent tasks, on the other hand, this was not the case. An example of the former is 'Can you put the teapot <u>on</u> the table'. An example of the latter is 'Can you put the road <u>in</u> the truck'.

It would be expected that if Clark's strategies applied always, younger children will put the road in the truck when requested to do so; that is, they should ignore the normal road-under-truck relationship between the two objects. The children tested were aged 1 year and 6 months to 3 years.

As far as the contextually congruent tasks were concerned, the children in Wilcox and Palermo's study performed in a way similar to that of Clark's children. However, the picture was quite different for the contextually incongruent tasks. Here the older children in particular interpreted the instructions incorrectly, placing the object-pairs in their more normal relationships. Instead of putting the road in the truck, for example, many placed it under the truck. (See, also, Strohner and Nelson's study (1974) of the non-linguistic strategies employed by young children for the comprehension of active and passive sentences.) As for the results of Wannemacher and Ryan with the term 'less', the kind of behaviour suggests that the young child does not work from perceptions of isolated objects.

Hoogenraad, Grieve, Baldwin and Campbell (1978) also have questioned the generality of Clark's non-linguistic strategies. They put forward an alternative explanation which is not unlike that of Wilcox and Palermo, placing considerable emphasis on the role of past experience in determining children's conceptions of the usual relations between objects. The authors point out that experiences may differ between children, as well as between children and adults. The conceptions of the relations between

objects may, therefore, differ. This being the case, we as adults may not always be able to make accurate predictions about the exact nature of the non-linguistic strategies which young children will employ for the learning of words. Indeed, some strategies have been inferred which are quite unusual from the adult point of view.

Donaldson and McGarrigle (1974) tested children's (3 and 4 year olds) understanding of utterances containing the quantifiers 'all', and 'more' in a situation of toy cars and garages. There were two unequal rows of cars arranged on two shelves, one directly above the other. Half of the time, joined sets of detachable and doorless garages were placed over the cars. For the longer row of cars (5), unlike for the shorter row (4), there was an extra unoccupied garage. The sentences given, and which the children had to make true/false judgements about, were - 'Are there more cars on this shelf or more cars on this shelf?', and 'Are all the cars on this shelf?'. The experimenter indicated the relevant shelf in each case. Each child received the two questions, both with and without the garage sets. One half got the garages present condition first and the other half got the garages absent condition first.

The interesting finding for the 'more' sentence was that fourteen out of the forty children tested changed their judgements about which shelf had more cars when the garages were introduced or removed. Thirteen of the fourteen correctly chose the longer row as having more cars when the garages were absent, but chose the shorter row as having more when the garages were present. The reasons given by the children suggested that they had based their judgements on the fullness of the garage sets.

There were two main interesting findings for the 'all' sentence.

First, nearly half of the children judged the sentence to be correct for each of the two rows all the time; that is, both in the presence and absence of the garage sets. This is not the interpretation of the situation one would expect from adults and older children. From an adult point of view, 'all' the cars cannot be said to be on one shelf when there were cars on the second shelf.

Donaldson and McGarrigle report that the children (except for two) could not give any justifications for their judgements. The reasons given by the two exceptions were not in the least instructive. One can only assume that young children's conceptions of the relationship between objects like cars and shelves are different from those of adults and older children. As Donaldson and McGarrigle themselves considered, it would have been possible (as a result of the differing conceptions) for the children to assume at the beginning of the task (when being introduced to the cars and shelves) that the cars on each shelf belonged to it, and in a way that excluded the cars on the other shelf. If such an assumption was made, then 'Are all the cars on this shelf?' will be taken to mean something like, 'Are all the cars meant for (or belonging to) this shelf on it?'

The second interesting finding for the 'all' sentence was that fourteen children judged it to be incorrect for the longer row but correct for the shorter one when the garages were present. As for the reasons given for the judgements of the 'more' sentence, the explanations of the children suggested that they had based their judgements on the fullness of the garage sets. This indeed is surprising, and, again, suggests that even where objects like

cars and garages are concerned, young children's conceptions may differ from those of adults and older children. From an adult point of view, the presence of the garages and their fullness are irrelevant factors and should not affect the judgements of the sentences.

The above kind of finding is not an isolated one. Similar results were obtained for another study carried out by Donaldson and Lloyd (1974). In a similar fashion to Clark, Donaldson and her colleagues postulated that the non-linguistic strategies employed by the young child must be hierarchially ordered. Furthermore, the non-linguistic concept of fullness is relatively high up in the hierarchy; higher than length, say.

Most of the authors whom we have been discussing suggest that the non-linguistic strategies which the child employs in the very early years for responding to partially understood expressions are abandoned as progress is made, both in the development of specific linguistic strategies and in the nature and richness of the child's non-linguistic concepts themselves. But this cannot be taken to mean that the child abandons non-linguistic strategies entirely. Language development takes many years. The dependence on non-linguistic strategies, therefore, probably remains with the child for some time. (For details of studies which reveal the late development of important language aspects, see the review by Palermo and Molfese, 1972.)

The conclusion that the initial dependence on non-linguistic strategies persists for some time in development was drawn, also, by McGarrigle and Donaldson (1975). There is some empirical support for the conclusion. Harris (1975), for example, investigated

4 to 12 year old children's understanding of some complex sentences. These are sentences which contain main verbs which take underlying sentences as their complements; as in 'Sally knew that she was early'. Harris found evidence that even the oldest children had not yet attained adult-level comprehension of the construction. Furthermore, on some of the tasks, the children tended to make pragmatic inferences and showed in comparison to adults, excessive dependence on knowledge about the world.

2.4 Implications of the Dependence of Language Development and Language Use on Situational Suggestions

The important implication of the dependence of language development and language use on situational suggestions is that young children may, in general, have greater faith in situational clues than do older children and adults. If this should be the case, it will be reasonable to expect the children to find it difficult to reduce the weight given to such clues when interpreting utterances. This kind of difficulty may account for young children giving only the situational or non-literal interpretations of communicative intent. At the same time, the difficulty may account for the children's failure on tests where the non-literal interpretations that can be given to the questions asked differ from the literal alternatives. We shall presently give the details of this explanation as it applies to Piaget's Conservation and Class Inclusion tests. But, first, we wish to turn attention to a problem associated with the evidence for children's use of non-linguistic strategies for the comprehension of partially grasped expressions. The problem has a bearing on the new explanation for Piaget's tests.

The problem is that young children may employ non-linguistic

strategies in test situations even when they possess adequate understanding of the linguistic expressions given. If the children have more faith in situational suggestions than others do then, it will be reasonable to expect them to act on the basis of such suggestions (especially where they make good sense) perhaps even where they are inconsistent with known linguistic meaning. Furthermore, children may not always recognize in the comprehension tests that what they are supposed to give is what the linguistic expressions stand for; and not just what the experimenter appears to be communicating with the expressions in the particular contexts. We appreciate the fact that the investigator may not get any further in resolving this problem by decontextualizing the expressions and asking directly what the key terms represent. Such an approach may be impracticable with young children. Older children and adults, on their part, will have little difficulty in grasping the nature of strict comprehension tests.

It follows from the above that we need not take evidence for the use of non-linguistic strategies as evidence for the inadequate knowledge of a linguistic expression. It may be quite possible by suitable selection of tests, to induce the 4 or 5 year old, for example, to employ these strategies for responding to some terms previously regarded as grasped by him. Admittedly, there is a danger of falsely concluding that children understand terms which they do not understand, but there is also a real danger of falsely concluding the opposite. Of particular interest to us here is the evidence cited in the last section for the term "more"; an expression used in both the Conservation and Class Inclusion tests.

The issue raised above has been considered also by Grieve,

Hoogenraad and Murray (1977). The work reported was concerned with children's understanding of the prepositions 'in', 'on', and 'under'. The authors suggest that in some cases, and at some point in development, the problem faced by the young child may not be that he does not understand the lexical content of some words. His problem, according to them, may reside in a relatively low confidence in his understanding of language. To quote the authors -

> "But the young child, of 1½ or 2 years say, has reason to be generally less confident of his understanding of language than he is of his appreciation and construal of the extralinguistic world. This may lead him to neglect his understanding of an utterance (to the extent that he does understand it of course) when it seems to him to conflict with what he believes, on the basis of his construal of the context to be an appropriate interpretation of what is required."
>
> Grieve et al, 1977, p. 236.

> "One consequence of this is that a correct response to an instruction involving in, on or under cannot be taken as proof of understanding of the preposition, since the response may be based on non-linguistic factors, as Clark (1973) has pointed out. But also note that an incorrect response cannot be taken as proof of a lack of understanding, since it may result from a conflict between the child's understanding of the preposition and what he believes to be an appropriate response in that situation."
>
> Grieve et al, 1977, p. 237.

2.5 Reappraisal of Piaget's Tests

Conservation:

We may compare the Conservation test with one of the situations described in section 1.4. This is the one where the utterance

'One has more than the other'

is made with relation to two amounts of mercury which differ in height in one direction and temperature in the other direction; thus suggesting at least two different interpretations for the utterance.

In the same way, the experimenter in the conservation test asks a "more" question after speaking about the intrinsic quantity attribute of some material and after transforming other attributes of the material. The subject may consider either the intrinsic attribute (speech-indicated) or the changeable properties (paralinguistically-indicated) as the intended criteria for judging the conservation question; or both the intrinsic value and the changeable values may be considered as being intended since these are not necessarily incompatible. The choice of criterion will depend on the magnitude of the weight given to the suggestion from the experimenter's transformation action. Where a subject gives considerable weight to the suggestion, and, as a result, takes the intended criteria to be the transformed properties, he will automatically give non-conserving responses.

Class Inclusion:

The subject in the Class Inclusion test is presented with a number of items which form two subclasses of one main class. The experimenter asks for a comparison of the size of the main class with that of the larger subclass. However, the fact that there are two subclasses provides a very strong indication that the subclasses are to be compared. This situational suggestion receives additional strength from the fact that ordinarily, it is more common to compare subclasses with respect to relative quantity. In other words, the presupposition expressed by the inclusion question describes an unusual, even though possible, state-of-affairs. We may compare the situation with the one given in section 1.4 where someone says

'David is mad'

after seeing David argue in earnest with his drunken pal, Paul. It

is not impossible for David to be mentally ill, but true mental illness or one which might call for psychiatric attention is not common enough for us to give a literal interpretation to the kind of statement most of the time. Furthermore, entering into an argument with someone who is not in a state fit for reasoning cannot serve as sufficient evidence for true madness. In the same way, a subject in the Inclusion test may give a non-ligeral interpretation to the inclusion question. He may attach considerable weight to the suggestion from both the immediate context and the real life context of class comparisons and, as a result, compare subclasses to arrive at a non-inclusion response.

The above accounts of how a subject might be led to fail on the Conservation and Class Inclusion tests sound very plausible indeed. However, as we shall see in the next chapter, the studies which purport to demonstrate the validity of similar accounts are not without some shortcomings which cannot be discounted by way of verbal arguments alone. In chapter 4, we report some experiments which were carried out with new tests to investigate the accounts further.

CHAPTER 3

Review of Relevant Experimental Studies

In this chapter, we shall review the studies which have been carried out to investigate the new account for failure on the Conservation and Class Inclusion tests, beginning with McGarrigle and Donaldson's (1975) study of the Conservation test.

The hypothesis investigated by McGarrigle and Donaldson (1975) is that young children fail on the Conservation test because they consider the experimenter's transformation action as relevant for the interpretation of the conservation question. According to the authors, the transformation action as performed by the experimenter, is irrelevant to the logical requirements of the test and to the interpretation of the question. The action, however, leads young children to infer an intention on the part of the experimenter to talk about what he has just been doing; that is, an intention to talk about the transformed properties.

In order to test the above hypothesis, McGarrigle and Donaldson (M & D) gave a version of the Conservation test in which the transformation of materials was presented as a by-product of an undesired activity. The undesired activity was made to be carried out by a small teddy bear introduced at the beginning of testing as being very naughty, and liable to escape from its box from time to time and mess up the game. After eliciting a correct judgement to the initial question in the task, the experimenter picked up teddy and moved it towards the aligned materials; expressing surprise and alarm at teddy's behaviour and unkind goal as he did so. Teddy was subsequently used to transform the materials. M & D hoped that by using the teddy bear in this way, the transformation will appear to the young subject as unintended for comment and, therefore, as

irrelevant to the interpretation of the conservation question when this was given.

The teddy task was named 'Accidental Transformation' condition and the traditional task was described as the 'Intentional Transformation' condition. Two quantities were investigated; number and length. The children tested were aged between 4 years 2 months and 6 years 3 months. M & D compared the children's performance on teddy number and length tasks with their performance on traditional number and length tasks.

The results obtained by M & D largely supported their hypothesis. Nearly three-quarters of the responses given in the accidental transformation condition were conserving responses. In the intentional transformation condition, on the other hand, conserving responses were given only a third of the time. Furthermore, while fifty of the eighty subjects involved in the study conserved on both the number and length teddy tasks, only thirteen subjects gave a similar performance on the standard tasks.

The above findings have been replicated in three independent studies. The first by J. Dockrell was cited in Donaldson (1978, p. 64). The second was carried out by I. Neilson at the University of Edinburgh, and the third by Light, Buckingham and Robbins (1979). In all cases, while the overall frequency of conserving responses was lower than that obtained by M & D, the finding of a much higher rate of such replies in the accidental condition was confirmed. In addition to repeating M & D's study of the length task, Light et al also investigated conservation of mass. For this, the authors employed an approach which differed from the one employing the naughty teddy. Instead of attributing the transformation of the pasta 'shells' used to a teddy, it was made to seem incidental to a competitive game.

As for the length task, Light et al got a significantly higher rate of conserving responses in this version of the mass task than they got in its standard form. We may conclude that there is considerable experimental support for M & D's findings.

There are, however, a few problems with the study. To begin with, the use of the term 'irrelevant' to describe the transformation action is perhaps unfortunate. The action is relevant in so far as the experimenter wants to find out by it whether subjects understand that quantities do not change in size merely as a result of changes in appearance. Further, if M & D introduced the term to draw attention to the fact that young children infer an intention on the part of the experimenter to discuss transformed properties, the term may have been uncalled for. Older subjects too may infer a similar intention. The subjects may differ from the young ones simply in attaching little weight to the inferred intention, thus reducing the potential of the transformed properties as the criteria intended for the judgement of the conservation question. We need not imagine then that older subjects give conserving responses because they consider the transformation action as irrelevant. The foregoing argument against the introduction of the notion of irrelevance into the Conservation test is similar to the argument presented in section 1.4 against the idea that older subjects interpret the words of test questions in isolation. In fact, the idea that the transformation action is irrelevant might have been borne out of working with a distinction between linguistic sentence meaning and speaker's meaning.

However, if we say that the transformation action is not irrelevant to the interpretation of the conservation question then, we may have to re-consider the facilitating effects of the teddy bear

in M & D's study. Specifically, the apparently undesirable nature of teddy's activities might not have caused the transformation action to be considered as irrelevant. The activities, instead, might have caused M & D's subjects to give less weight to the transformation which takes place as older subjects would be moved to do in the traditional task.

Another unfortunate aspect of M & D's work is the idea that the experimenter's transformation action on its own may account for children's non-conserving responses. The study carried out by Rose and Blank (1974) shows this idea to be false.

Rose and Blank (1974) investigated a hypothesis that children give non-conserving responses because they take the repetition of the question after the transformation as a cue to alter the initial judgement made to acknowledge the transformation. The authors noted that in the normal (non-experimental) course of events, one would never ask the same question twice if a significant change had not occurred in the material that was being observed; the second asking of the question being directed at the change.

Rose and Blank proceeded to give a form of the number conservation task in which subjects saw the experimenter transform the task materials but were asked to give a judgement only after the transformation; that is, only one judgement (and not two as in the standard task) was requested. This was appropriately called the One-judgement task, and performance on it was compared with performance on the standard task.

There was also a control condition. In this condition, subjects saw the materials only in their transformed state; that is, they did not see the materials arranged first in one-to-one correspondence.

This was called the Fixed-array task. According to Rose and Blank, the condition was given to ascertain that any improved performance in the one-judgement task was not due simply to the asking of a single question, but rather to the context in which the question was asked. It was considered that where the materials are seen in their aligned state before the conservation question is asked, the child is likely to make use of this information in answering the question. On the other hand, when the question is asked where the materials have never been seen in alignment, the child is likely to be influenced more by the qualitative or perceptual differences, and to rely on this in formulating his answer.

The three different conditions were given to three different groups of twenty eight children whose mean age was 6 years and 3 months.

As the authors anticipated, more conserving responses were given on the one-judgement task than on the standard task or the fixed-array task. Specifically, errors were more than halved on the one-judgement task relative to the other two tasks. This result is not to be expected from M & D's account; for the experimenter performed the transformation in the one-judgement task as happens in the standard task. The result demonstrates quite clearly that the experimenter's transformation action cannot by itself account for children's non-conserving responses. Other factors in the test must be making equally important contributions to the responses. In particular, any effect of the action is partly due to the pre-transformation interaction (verbal and non-verbal) between the subject and the experimenter.

A final and vital criticism of M & D's study is that their

results might not have amounted to evidence that young children are capable of conserving length and number. It could be suggested, for example, that the children gave conserving responses in the accidental condition because they based their judgements on the pre-transformation arrangements of the materials. This suggestion could be made if it is considered that the children might have rejected the reality of the transformation; this would be especially because it was presented as undesired and its agent was inanimate. There is some evidence that children could be influenced by the previous look of task arrays. This evidence comes from the study by Donaldson and McGarrigle (1974) mentioned in the last chapter. Some of the children who received the garages-present condition first behaved in the subsequent garages-absent condition as if the garages were still there. (We might say that the absence of the garages was rejected.) The trouble with this explanation for M & D's study is that one could argue that it might require the same cognitive effort to base the judgement of the conservation array on the pre-transformation arrangement as to base the judgement of the array on the post-transformation arrangement.

Alternatively, it could be suggested that M & D's children merely held on to their pre-transformation judgements; that is, the judgements themselves were repeated regardless of the pre- and post-transformation arrangements of the materials. It could be suggested for this explanation that the children could have regarded the teddy bear's activities only as an undesirable interruption of the experimenter's interrogations (Neilson, Dockrell and Campbell, 1979). This sounds a very reasonable explanation. However, if M & D's children could have engaged in the above line of reasoning, what <u>stops</u> them from thinking that the property which becomes transformed as a

result of teddy's undesirable activities is not the intended referent of the conservation question? And if the children engaged in this reasoning, what stops it from being the explanation for their behaviour in the teddy tasks? It could, however, be maintained in spite of the explanation that M & D's children did not give conserving responses because they were capable of conserving length and number. The responses could be seen as mere artefacts of the 'teddy' situation.

In a way, the investigator who assumes the position that the conserving responses in M & D's accidental condition were induced by the situation is in no better position than his colleague who assumes that non-conserving responses in traditional tasks are similarly induced by situation. There can be no easy way of resolving the issue. Moreover, one may have to extend the argument to other studies which have claimed that young children are capable of conservation. Of particular interest are those studies which did not involve any changes being made to the format of the test (Wallach, Wall and Anderson (1967), Gelman (1969)). In these studies, the investigators administered some special training programmes before giving the standard task.

The hypothesis investigated by Gelman (1969) was that young children fail on standard conservation tests because they attend to 'irrelevant' features of the tests. This was meant in the sense that the children have a natural preference for the features which happen to be irrelevant for these tests. Gelman also noted that when the experimenter introduces the transformation, children's attention is likely to be drawn to 'irrelevant' cues. She suggested that the manipulation would enhance the likelihood of a child using irrelevant features to arrive at his judgement, since movement or change is normally a way of bringing attention to an attribute.

Understandably, the apparent aim of the training programme devised by Gelman was to get children to attend to quantity (so-called relevant quantity cues) and to ignore non-quantitative attributes (so-called irrelevant cues). The programme consisted of length and number discrimination tasks and the problems given were similar to conservation problems. The subject's task on each trial was to point either to two of three stimulus objects that had the same quantities or two that had differing quantities. The training was given to two groups of 5 year old children; with one group receiving feedback about their responses.

As one would expect, the discrimination training tasks which incorporated feedback were highly successful in teaching Gelman's children to attend to quantity. (It is worth noting here that at the beginning of the training, the children in the two groups attended to quantity 60% of the time.) More important, however, almost all the children who received the training gave conserving responses on subsequent trials of length and number conservation tasks. Also, about half of the children gave conserving responses on subsequent trials of mass and liquid amount tasks. In contrast, the children who received the no-feedback training showed little improvement in attention to quantity during training, and relatively few of them gave conserving responses on subsequent conservation tasks. Gelman was led to suggest that appropriate training for attention to quantity (relevant cues in her words) must involve feedback of information about the correctness of responses.

As for the results obtained by Rose and Blank (1974), Gelman's results could be employed to argue for the inaccuracy of M & D's hypothesis. In fact, the results of any study based on a different

kind of hypothesis from M & D's could be used in this way. (See, for example, Frank (1966); Griffiths, Shantz and Sigel (1967); Braine and Shanks (1965a; 1965b); Gruen (1965); Farnham-Diggory and Bermon (1968); Peters (1970); Harasym, Boersma and Maguire (1971); Gelman (1972), and Siegel (1978)). As did the finding by Rose and Blank, these other findings suggest that the experimenter's transformation action in the standard Conservation test cannot by itself account for children's non-conserving responses.

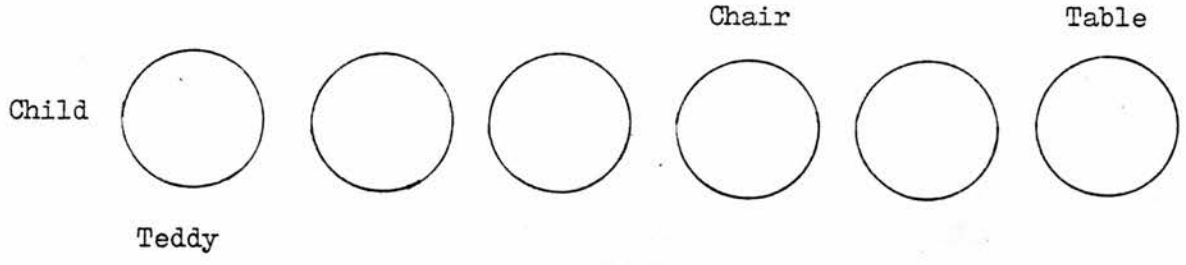
It is worth noting that, as for M & D's study, each of the studies mentioned above is plagued by problems which make it difficult to accept the exact interpretations offered for the results. Considering Gelman (1969), for example, her claim would suggest that conservers and non-conservers would differ in the attributes which are most salient for them. This prediction was not confirmed in a test conducted by Miller (1973). As for those investigators who attribute children's non-conserving responses essentially to a failure to understand the key terms in the conservation question, we are reminded of the discussion in section 2.4.

We wish to turn next to the consideration of McGarrigle, Grieve and Hughes' (1978) study of the Class Inclusion test.

The hypothesis investigated by McGarrigle, Grieve and Hughes (1978) is that young children fail on the traditional Inclusion test because they assume that subclasses will be compared in the test. The authors introduced certain minor changes to the test which were aimed at emphasizing the whole-class, and thereby discouraging the subclass comparison assumption. The changes were directed at both the task array and the inclusion question. In all, six experiments were carried out involving two different kinds of materials. We

shall consider here the fourth and fifth ones.

In these experiments, emphasis of the whole-class was partly achieved by the introduction of new additional materials to the task array. These were a toy teddy, a toy table and a toy chair. The actual inclusion materials, six plastic discs, were presented as teddy's steps. The teddy and his properties were arranged as shown with the child sitting near teddy's first step.



The task was introduced to the child as one involving judgements of the teddy's journeys to its chair (larger subclass) and its table (whole class). In Experiment 4, the steps leading to teddy's chair were red in colour and the steps leading from the chair to the table were white in colour. In Experiment 5, on the other hand, there was no intrinsic perceptual contrast between the subclasses of steps; all were white.

Five questions were given; questions four and five being repeats of questions one and two.

> Are there more red (or 'white' in Experiment 5) steps to go to the chair or more steps to go to the table?
>
> Are there more steps to go to the chair or more steps to go to the table?

Is it further to go to the chair or further to go to the table?

Repetition of first question.

Repetition of second question.

The questions were called A_1; B_1; C; A_2; and B_2 respectively. The A questions, it would be noted, are most similar to the traditional questions because they involve the subclass set being qualified differently from the whole class set. The B questions involve no such qualification. The children tested were aged between 3 years 7 months and 5 years 3 months.

The results obtained helped to support McGarrigle et al's hypothesis. More children than one finds with the traditional inclusion test made inclusion judgements in the new situation. Moreover, in spite of the difference between Experiments 4 and 5, in the subclasses of steps, the results for them were very similar. The only difference in results was that in Experiment 4, performance with the B questions (not involving the larger subclass being qualified differently from the whole class) was better than performance with the A questions. There was no such performance difference between the A and B questions in Experiment 5. These results seem to demonstrate that it is the way in which the task array interacts with the language of the inclusion question which explains young children's performance on the task. Specifically, even when there exists a marked perceptual contrast between the subclasses, when this is not mentioned in the question, children's performance may be less influenced by the contrast.

The other result obtained by McGarrigle et al was that

performance was best with question C which involved a different word (further) from the one found in the standard inclusion task (more). Furthermore, experience with this question led to improved performance with consequent A and B questions.

The idea that young children fail on the standard Inclusion test because they assume that subclasses will be compared is not new. It was put forward by Wohlwill (1968), for example. However, Wohlwill did not provide as clear a demonstration as McGarrigle et al did of the relationship between the task array and the inclusion question. Wohlwill hypothesized that children develop a "perceptual set" upon seeing the two perceptually distinct subclasses which are unbalanced as to number. This set, according to him, leads the children to translate the inclusion question into a subclass comparison one.

Wohlwill went on to give the Inclusion test in a purely verbal form; that is, he did not make use of pictures or physical classes which were supposed to generate a 'set'. This new form of presenting the test, however, made it necessary to give the inclusion question in a more elaborate form than is found in the traditional test. To give an example from a class of roses and violets; instead of asking the child "Are there more flowers or more roses?" the experimenter asked, "If I had six roses and two violets, would I have more flowers or more roses?"

The children tested by Wohlwill (mean age 5 years and 11 months) performed significantly better on the purely verbal tests than they did on standard pictorial forms. The effects of practice with the Inclusion test were also examined and it was found to be effective in bringing about improved performance. (See also Ahr and Youniss (1970), Winer and Kronberg (1974) and Tatarsky (1974)).

A study carried out by Winer (1974) made up for the limitations of Wohlwill's verbal test study. Winer compared performance on a standard Inclusion test with performance on a purely verbal test on the one hand and performance on a pictorial test in which the question was worded as in the purely verbal test on the other. No significant difference was found between performance on the verbal test and the verbally elaborate pictorial test. At the same time, performance on both these tests was better than performance on the standard test. Even though Winer did not interpret his results as such, they may be regarded as providing a clearer demonstration than Wohlwill's study did of the interaction between task array and question in the Inclusion test.

Some of the other investigators who have considered that children are misled on the Inclusion test by a subclass-comparison assumption have emphasized the role of past experiences in the arrival at the assumption. Kalil, Youssef and Lerner (1974), for example, observed that it is more likely that young children encounter situations which require comparisons between mutually exclusive classes and subclasses (like "boys" and "girls"), rather than comparisons between a superordinate class and one of its subordinate classes (like "children" and "boys"). Such experiences, according to Kalil et al, would lead to the development of "learning sets" orienting the children toward making the first kind of comparison. The authors suggested that without attenuation of the inferred learning sets, the young child may misconstrue the class-versus-subclass question, and believe a comparison between the two subclasses was intended. It was proposed that all that the child has to do to arrive at this false belief is to use the name of the total class as a reference to the unmentioned subclass. (See, also, Hayes, 1972).

However, it is still possible in spite of the evidence amassed by the investigators cited above for someone to argue that children fail on the Inclusion test for reasons other than the one suggested. As several investigators have done for the conservation question, quite a number of investigators have maintained that children do not understand the key terms in the traditional inclusion question. (See Markman (1973), Shipley (1975), Markman and Seibert (1976) and Siegel, McCabe, Brand and Matthews (1978)). In some cases, alternative terms have been employed to test the children's understanding of inclusion. McGarrigle et al's own result with the term "further" may be said to bear out this contention. Moreover, the objection of possible situational induction may be made against the results from all the studies mentioned; that is, the modified tests might have merely induced the children studied to give inclusion judgements without necessarily proving that inclusion ability is within the children's means.

Nevertheless, the more immediate question for us to try to answer is one of whether young children could indeed be misled in Piagetian concrete-operations tests in the manner prescribed by McGarrigle and his colleagues. Specifically, do children give more weight to situational suggestions than others do when they interpret questions in tests? If we are to follow the trend of the arguments in this chapter, it will become clear that what we require is a new test which, like the Piagetian tests, makes possible a situational interpretation that is at variance with the more literal interpretation of its question, but which, unlike the Piagetian tests, provides limited opportunity for disagreements as to the reason behind the responses elicited.

Chapter 4

Experiments with the Tower-Building Test

General Introduction: The Tower-Building Test

The experiments reported here are mainly concerned with the role of perception of the situation in young children's decisions about the intended message of questions in Piagetian concrete-operations tests. In particular, we investigated further the contention that these children may fail on such tests because they give to the critical test questions situational interpretations which differ from the more literal alternatives.

We employed a new 'tower-building task' similar in design to the conservation task. As in that task, and the class-inclusion task, the situational interpretation of the critical question in the tower-building task is at variance with its more literal interpretation. In addition, the task is constructed so that a subject could fail merely as a result of giving the situational interpretation.[8]

The objective was to find whether or not young children will give the situational interpretation and, therefore, give responses which indicate failure ordinarily. The first four experiments were particularly concerned with this objective.

Experiment 4.1

Introduction:

Subject and experimenter were seated at a table. The task began with the subject being told that he and the experimenter would be building towers with blocks lying on the table. The experimenter then went on to point out that too few of the blocks were supplied and it would be necessary to obtain some more. Then, instead of providing the promised blocks, the experimenter embarked on another activity - counting cylinders which were also present on the table. One could also build the towers with the cylinders, and actually, more of them than the blocks were provided. However, the superficial expectation was that the act of counting could make some subjects forget what the experimenter had said about finding more blocks. In other words, the counting act was a potential interfering event.[9]

The cylinder counting was carried out in silence, and upon its completion, the experimenter asked the subjects about the blocks. The critical question was, 'Are there any more of them in that box under your chair?'; the word 'them' being intended according to what had been said first, as a reference to the blocks alone. However, the box in question contained only cylinders. The response given to the critical question, therefore, was expected to indicate whether or not a subject remained attentive to what was said at the start about the use of blocks to build towers and the need for more of them.

We expected that a subject who attended to what had been said in this way should say something like, 'No, there are none of them'. Any response contrary to this would ordinarily have suggested a

failure to think of the blocks; the most likely one being, 'Yes, there are some of them'. This kind of response depended of course, on the counting act having the particular effect of redirecting a subject from the blocks to the cylinders in his thinking. Where it has a different effect, other responses may be expected.[10] (Full details of the task will be given in the Procedures.)

An alternative view of the experimenter's counting:

The alternative view of the experimenter's counting is that it could be seen by subjects as contributing information about the objective of the task; that is, it could be taken as a suggestion that the cylinders as well will be used to build the towers. There were two main reasons for expecting this effect, (a) the cylinders were suitable, like the blocks, for building towers, (b) the act of counting was quite consistent with the idea of obtaining more of what to use for the towers. However, this assumption will lead to a different understanding of the critical question, giving the intended referent to be the cylinders together with the blocks.

Given the way the task was presented, one would expect a subject who arrives at the above understanding to give one of the following affirmative replies - 'Yes, there are some cylinders but no blocks' or 'Yes, there are some of them'. We shall be referring to the two kinds of responses together as Yes-responses.

The second Yes-response is less elaborate than the first one. More important, it can give the impression that the question had been understood as a reference to the cylinders alone, and not to

the blocks at the same time. In fact, the response is identical to the one which we said would ordinarily suggest a failure to think of the blocks.

Thus we conclude that a subject could give a response which indicates failure mainly because of the situational suggestion about the cylinders, and not because he fails to think of the blocks.

It was hypothesized that most young subjects will give a lot of weight to the suggestion about the cylinders and give the Yes-responses as a result. Moreover, it was considered that many of the subjects will give the Yes-response which could otherwise indicate failure. Such results will provide tentative support for the claim that young children may fail on Piagetian concrete-operations tests because they give to the questions situational interpretations which are different from the literal alternatives intended by the experimenter.

We also gave the task in a control form in which the experimenter did not count the cylinders. This was included to check the role which the counting played in the responses of the 'treatment' group.

In addition, adult subjects were included in the experiment to help us arrive at a correct assessment of the developmental significance of the responses of our young subjects. If adults behaved in the same way as young children, there would be no grounds

for making any developmental conclusions from the experiment. Specifically, if both adults and young children give the Yes-responses, it may be indicated that the task is such that the only interpretation which can be given is the situational one.

Subjects:

(i) Thirty children ranging from 4 years 8 months to 4 years 1 month in their ages (mean age 4 years 5 months). The children attended nursery schools in Edinburgh, and were of mixed social class.

(ii) Ten university students.

Materials:

(i) Coloured wooden blocks of one cubic inch size.

(ii) Plain wooden cylinders of height one inch, thickness one-fifth of an inch and diameter approximately one inch.

(iii) Two crumpled pieces of paper.

(iv) Two square wooden boxes, each about four and a half inches deep and wide.

Design:

The children were placed in two equal groups. The treatment group was denoted as Group I, while the control group was denoted as Group IA.

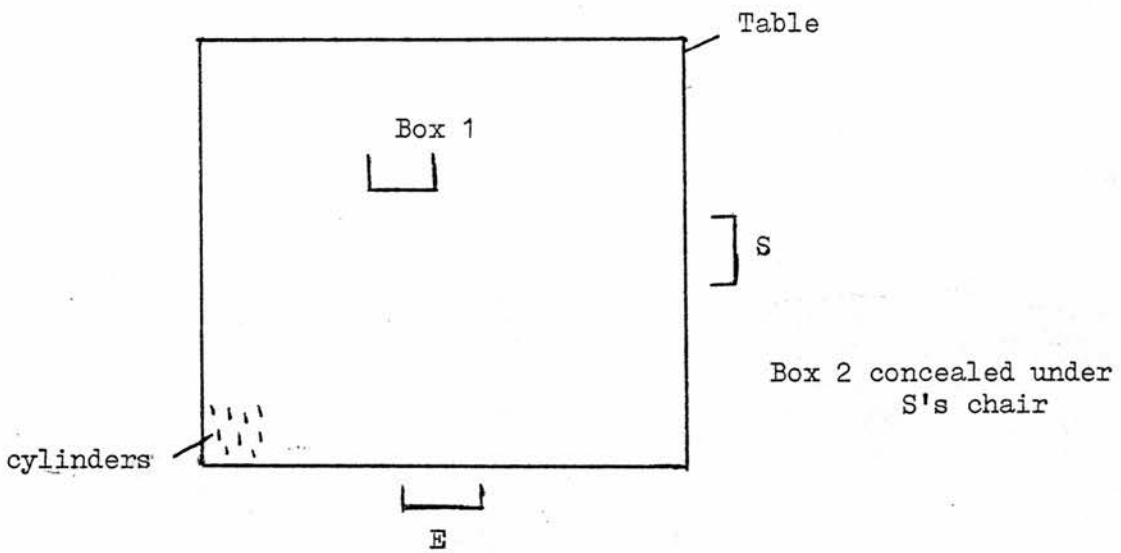
The adults made up a third group denoted as Group IB. This group received the same treatment as Group I.

Procedure:

The experimenter (E) and the subject (S) sat at adjacent sides of a square table with S to E's right. One of the two boxes, (Box 1),

was kept on the table with three blocks of different colours and three cylinders inside it. At the corner of the table, on E's left, were nine other cylinders. Concealed under S's chair was the second box, (Box 2), with about seventeen cylinders and two crumpled pieces of paper in it.

A sketch of the arrangement is given below.



To begin with, E asked some general questions of S to put him at ease. Following this, the following dialogue was initiated:

E - Have you ever tried to build a tower?

S - Yes/No

E - Good, and that is what we are going to play at now.[11] You will build your own tower, I will build my own tower, and we shall see whose tower is going to be the taller one, okay?

(E then took out the blocks and cylinders from Box 1).

E - These are two things (indicating each one with the left hand) that we have on the table, shall we use these ones or shall we use these ones for building the towers?

(S could choose the blocks or the cylinders).

For Blocks - Choice

E - Those ones, what are they called?

S - Blocks

E - They are called blocks, good.

For Cylinders - Choice

E - Why don't we use these ones (indicating the blocks), shall we?

S - Alright

E - Good, what are they called?

S - Blocks

E - They are called blocks, good.

(So all subjects were persuaded explicitly to agree to use the blocks.)

For both the blocks-choice and the cylinders-choice the experimenter continued by saying:-

E - Right, well, we haven't got enough of them, have we?. So I must get some more.

For the next 15 seconds or so E engaged in one of two acts depending on the group to which S belonged. In both cases the act was carried out in complete silence. All questions and comments from S were ignored.

Group I and Group IB (Treatment)

E counted the cylinders on the table including the ones placed on her left. As explained in the introduction section, this counting was expected to suggest to the subject that the cylinders as well would be used for building the towers.

Group IA (Control)

E cleaned her nose with tissue paper. She did not count the

cylinders.

Some few seconds following the act in each case, E, indicating Box 2 with her index finger, put the critical question of the task to S ,

E - 'Are there any more of them in that box under your chair?"

Care was taken to ask the question in a tone and manner which would make S feel that E had no previous knowledge of the presence of the box or at least of its contents. Keeping the crumpled pieces of paper in the box was part of the effort to give this impression.[12]

Apart from the responses mentioned in the introduction to the experiment, another kind of response was found during our pilot studies. This was 'Which one (do you mean)?'. This response was taken to imply an uncertainty as to whether to give considerable weight to the suggestion about using the cylinders.

Scoring:

Responses were placed in three main categories. These were named a) Yes-response, b) No-response and c) Question-response.

The Yes-response category was further sub-divided into failure-response and elaborated-response categories.

Responses placed in the first sub-category included, 'Yes', 'Yes, look', 'There, there are some', and simple nodding of the subject's head.

Responses placed in the second sub-category included, 'Yes, not some of those kind (that is, blocks)', and 'Yes, only these'. (The distinction between the two sub-categories followed from the description given in the introduction section.)

The responses which were placed in the No-response category included, 'No', 'No, there is only these (cylinders)', 'No, these are the round ones', 'Only these ones', and simple shaking of the subject's head.

Finally, responses placed in the Question-response category included, 'Of them (cylinders)?', and 'Any more of them (cylinders)?'. Subjects who gave responses of this last kind were counter-questioned to enforce a decision from them so as to enable their placement in one of the first two categories. Where a subject decided after this further questioning that the experimenter could be referring to the cylinders, (that is, if he gave considerable weight to the suggestion about the cylinders) he was placed in the Yes-response category. Where, on the other hand, he decided that the experimenter meant the blocks, he was placed in the No-response category.

Those who refused to make a decision at this point were taken as not wanting to regard the question as referring to the cylinders, and were subsequently placed in the No-response category.

In analysing the results, the number of subjects who gave considerable weight to the suggestion about the cylinders were compared with the numbers who ignored it - that is,

Yes-responses (in general) were compared to No-responses.

Then, the numbers of subjects who gave the failure-response were compared with the numbers who did not do so; that is,

Failure-responses were compared to elaborated responses and No-responses.

It should be noted that a question-response leaves no doubt that a subject has both the blocks and cylinders in mind. Even where a subject consequently decides that the experimenter could be referring to the cylinders, it cannot be suggested that he failed to think about the blocks. Therefore, a subject who gave a question-response was not placed in the failure-response sub-category.

Other questions put to subjects on the task

After they had responded to the critical question of the task, subjects were given some other exploratory questions, and the responses to these were also analyzed. These questions are given below, together with the different responses expected for them. They are referred to as Q1, Q2 and Q3. The set of questions for each subject depended on which of the above response-categories he fell into, and also on which of the two conditions (treatment and control) he was given.

Q1 was given to failure-response subjects, regardless of condition.

Q2 and Q3 were given to all treatment subjects, regardless of the response category.

Q1 - What did we not have enough of and I was going to get more of them?

S - Blocks/Cylinders/I don't know.

(This question was included to test further subjects' memory for the aspect of the task which preceded the experimenter's distracting activity.)

The number of subjects who gave indication of remembering what the experimenter said about the blocks was compared with the number that gave no such indication; that is, 'Blocks' replies were compared to replies such as 'Cylinders' and 'I don't know'.

Q2 - You saw me doing this (E repeats counting) just now, what did you think I was doing when I was doing that?

S - Counting them/I don't know.

Q3 - And what did you think I was going to do with them after counting them?

S - Build with them/I don't know.

(Q2 and Q3 were included as aids for more direct evidence that the experimenter's counting was indeed seen as suggesting that the cylinders as well were to be used for the towers. A subject was given Q3 only if he claimed in response to Q2 that the experimenter was counting the cylinders.)

The number of subjects that explicitly assumed that the cylinders were going to be used was compared with the number that denied making the assumption, that is, 'Build with them' replies were compared to 'I don't know' replies.

Before we go on to the results, we shall specify the particular similarities between the tower-building task and the conservation task.

Similarities between the tower-building task and the conservation task

1) On both tasks, the experimenter begins by explicitly suggesting something in speech; in one case, that quantity will be

compared, in the other, that towers will be built with blocks.

2) On both, the initial verbal suggestion is followed by an act from the experimenter. This is the outstanding similarity between the tasks.

3) In each task, the experimenter's act is suggestive. In one case, the act suggests that attributes other than quantity will be compared. In the second case, it is suggested that a material other than the one implied in the experimenter's speech will be used.

4) Finally, as already noted, the suggestion from the experimenter's act in both tasks leads to an understanding which is different from the more literal interpretation of the critical question.

Results:

TABLE 4.1 (a)

Numbers of subjects in the different response-categories

	N	Yes-responses	No-responses	Question-responses
GROUP I 4 years 8 months - 4 years 2 months	15	11 (+1)	2 (+1)	2 (-2)
GROUP IA 4 years 8 months - 4 years 1 month	15	2	13	-
GROUP IB Adults	10	-	7 (+3)	3 (-3)

The plus and minus signs show how the question-responses transferred to the other two response-categories with further questioning.

1) 12 of the 15 (80%) young treatment subjects gave Yes-responses. The remaining 3 (20%) gave No-responses.

Among the control subjects, on the other hand, only 2 (13%), gave Yes-responses. The rest gave No-responses. This difference between the two groups was significant ($p < 0.005$, Fisher exact probability test).

2) All the adult subjects gave No-responses. The difference between them and the young treatment group was significant ($p < 0.005$, Fisher exact probability test).

TABLE 4.1 (b)

Number of failure-responses and other responses

	N	Failure-response	elaborated - response	No-response
GROUP I	15	9	2 (+1)	2 (+1)
GROUP IA	15	1	1	13

9 of the 15 (60%) young treatment subjects gave the failure-response. This compares with only one (6.67%) of the control subjects. The difference between the groups was significant. ($p < 0.01$, Fisher exact probability test).

TABLE 4.1 (c)

Responses given to Q1 by the failure-response subjects

	N	Q1		
		Blocks	Cylinders	I don't know
GROUP I	9	6	2	1
GROUP IA	1	1	-	-

1) 6 of the 9 (67%) failure-response subjects from the young treatment group gave evidence in their replies to question Q1 that they remembered what went before the experimenter's interfering act on the task.

2) The one failure-response subject from the control group did the same.

TABLE 4.1 (d)

Responses given to questions Q2 and Q3

by the treatment subjects

	N	Q2		Q3	
		Counting them	I don't know	Build them	I don't know
GROUP I	15	14	1	11	3
GROUP IB	10	10	-	5	5

1) All but one (93%) of the young treatment subjects stated that they saw the experimenter's distracting movement to the cylinders as one of counting. 11 of the subjects (73%) claimed that they considered that the cylinders were going to be used for the towers.

2) All the adult subjects claimed that they saw the experimenter's act as one of counting. Half of them claimed that they thought the cylinders were going to be used. The difference between the two groups in the numbers that made the claim was not significant. (Fisher exact probability test).

Discussion

The results in Table 4.1 (a) that 80% of the young treatment subjects gave Yes-responses while only 13% of the young control subjects did so, indicates that the experimenter's counting, at least, was responsible for the Yes-responses of the treatment subjects. If we take it for granted that it was the suggestion generated by the counting that was responsible for the responses, this result, together with the result that none of the adult subjects gave Yes-responses (Table 4.1 (a)), suggests that young children give more weight to situational suggestions than others do when responding to test questions.

On its part, the result that many of the Yes-responses of the young treatment group was of the failure-response kind (Table 4.1 (b)), suggests that young children may fail on Piagetian concrete-operations tasks merely because they give considerable weight to what the situations suggest about the experimenter's intentions for the critical questions asked.

However, this second (and more important here) conclusion might be challenged. It could be argued that subjects who gave the failure-response, whether or not they did so as a result of the situation of the task, did not understand the critical question as referring to the blocks at the same time as the cylinders. In other words, the subjects who gave the response might actually have failed to think about the blocks. Should this have been the case, we will not be justified in making the above conclusion. It is unlikely, however, that the argument can be sustained.

To begin with, there is the evidence from the responses given to question Q1 (Table 4.1 (c)).

The replies suggest that the subjects thought all the time of the blocks. Apart from this evidence, many of the subjects, after building happily with the cylinders asked the experimenter where they could obtain 'the blocks' from. It could be considered, though, that the kind of evidence is not particularly reliable. It would have been possible for our subjects to recall what was said about the blocks at the time of question Q1, even though they had failed to do so at the time of the critical question. However, there is another kind of evidence in favour of the argument that this was not the case.

The evidence comes from the fact that our subjects assumed that the cylinders will be used for building.[13] The assumption derived partly from the idea communicated in the experimenter's speech that the blocks will be used for this purpose. One must recognise that the fact that the cylinders by themselves could be used for towers, and the fact that the experimenter's counting was consistent with the idea of obtaining more of something, could not on their own have generated that assumption. The counting should have led to the assumption being made only partly because it was initially indicated in the experimenter's speech that towers were to be built; and with the blocks. The idea being pressed is similar to the one which was observed in the last chapter for the suggested influence of the transformation action in the Conservation test. A particular aspect may appear to dominate the individual's judgement, but that aspect does not have influence independently of other related aspects.

However, under the circumstances described, a subject who gives weight to the suggestion about the cylinders must at the same time

take account of the idea that the blocks will be used. Our subjects who believed cylinders to be accepted by the experimenter, and gave the failure-response as a result, must, therefore, have had the blocks in mind.

There is, however, a further objection which could be raised. It could be considered that our subjects might after all have given little weight to the suggestion about the cylinders when interpreting the critical question. The experimenter's counting might have influenced the responses of the young treatment subjects for quite different reasons.

To begin with, many of the young and adult subjects for whom the experimenter counted the cylinders did claim that they assumed that the material was going to be used (Table 4.1 (d)). Added to this evidence were the comments made by some of the young subjects while the experimenter made the count. There were comments like, 'What are you doing that for?', and 'Are we going to use them (cylinders) too?'. With these results it cannot be suggested, at least, that the subjects might not even have seen the counting as having implications for the task. It is noted that in comparison with 73% of the young subjects, only 50% of the adult ones claimed that they had made the assumption. This difference was not found to be significant and it can probably be explained.

The adults, unlike the young subjects, gave the impression of being very concerned or anxious about the experimenter's reason for wanting to know what they had assumed. It appears as if they felt that the whole idea of the testing had to do with the answers

to the questions about the assumption (questions Q2 and Q3), even though none of them succeeded in making out the real reasons for the questions. This anxiety over the judgements which the experimenter intended to make about the responses could have acted to restrain some of the adults from volunteering their thoughts regarding the act. Considering this observation, we can take it that most of the subjects tested must have made the assumption which it was expected that the act would ordinarily generate. However, it could be suggested that it need not follow from this that the assumption was responsible for the responses of the young subjects.

It could be considered for the failure-response in particular that, at the same time as suggesting that the cylinders would be used, the experimenter's counting might have been capable of causing subjects to fixate on the cylinders. Young subjects are supposed to be highly susceptible to the kind of influence. Such fixating can only result in a failure to think about the blocks. And this, it could be explained, could have led the children to interpret the question as they did. The adult subjects, on the other hand, would not have given the failure-response because they are less susceptible to the kind of influence.

Actually each adult subject was asked at the end of his testing why he did not see the question as referring to the cylinders. The most common reason given was that what the experimenter had <u>talked about</u> were the blocks. Upon being reminded of the fact that they had claimed that they got the impression that the material was going to be used as well, they only insisted more strongly that the experimenter had talked only about the blocks. This reasoning was taken to imply that the adults exercised a deliberate discrimination

against the suggestion because of its non-verbal origin.
It appears then that the adults did not take the critical question to refer to the cylinders, not because they did not fixate on it, but because the suggestion about it was not given directly in the experimenter's speech.

However, this result does not necessarily argue for the conclusion that the young subjects, on their part, did not give their responses because they fixated on the cylinders, and forgot about the blocks. The kind of explanation which holds for the responses of the adult subjects does not have to hold for the responses of the young ones.

The experiment which we shall be reporting next, further investigated the assumption that the situational suggestion about using the cylinders was responsible for the responses of the young subjects.

Experiment 4.2

Introduction:

The aim of the experiment was to investigate the role of the situational suggestion about using the cylinders in the responses of our young subjects.

It was reasoned that if the suggestion about using the cylinders was not responsible for the responses of the subjects, the same kind of responses as before (Yes-responses) should be given when the situation of the task is such that an assumption about use cannot be made. If, however, the suggestion about using the cylinders was responsible for the Yes-responses, we considered, a different kind of response (No-responses) should be given in such different circumstances. This was the consideration on which the present experiment was based. It is the same kind of consideration on which McGarrigle and his colleagues based their investigation of conservation and class inclusion behaviour.

To achieve the desired kind of situation, we now employed a material with which one cannot build towers. It was claimed while describing the task in the first experiment that the fact that the cylinders can be used for building towers was expected to assist the suggestion that they will be used for the purpose. Where the material counted on the task cannot be used for building, there should be no suggestion of use from its being counted. The experiment involved a new group of young children, and the material used to replace the cylinders was marbles. Most young children are familiar with marbles, and it was hoped that the ones tested would know from their experience with them that one cannot use them to build anything like a tower.

Subjects:

Fifteen nursery school children ranging in age from 4 years and 9 months to 4 years (mean age 4 years and 5 months).

Materials:

The same as for the first experiment, except that marbles replaced the cylinders.

Design:

There was only one group of children; denoted as Group II.

All subjects were treated to the same condition.

The results obtained were compared with those obtained for the young treatment subjects (Group I) in the first experiment.

Procedure:

This was given as for Groups I and IB in the first experiment; marbles taking the place of cylinders as already explained.

Question Q1 was considered to be no longer necessary, so it was omitted from the procedure.

Results:

TABLE 4.2 (a)

Numbers of subjects in the different response-categories

	N	Yes-responses	No-responses	Question-responses
GROUP II 4 years 9 months - 4 years	15	5 (+1)	7 (+2)	3 (-3)
GROUP I 4 years 8 months - 4 years 2 months	15	11 (+1)	2 (+1)	2(-2)

The number of subjects who gave Yes-responses in the present experiment was much less than the number that did so in the last one. 60% of the present subjects, in comparison with only 20% of the last one, gave No-responses. The difference was just significant ($p < 0.05$, Fisher exact probability test).

TABLE 4.2 (b)

Numbers of failure-responses and other responses

	N	Failure - responses	Elaborated - responses	No- responses
GROUP II	15	4	1 (+1)	7 (+2)
GROUP I	15	9	2 (+1)	2 (+1)

The number of subjects who gave the failure-response in the present experiment was less than the number that did so in Experiment 4.I. The difference between the results, however, was not significant (Fisher exact probability test).

TABLE 4.2 (c)

Responses given to questions Q2 and Q3

	N	Q2		Q3	
		Counting them	I don't know	Build them	I don't know
GROUP II	15	14	1	4	10
GROUP I	15	14	1	11	3

All but one (93%) of the Group II subjects claimed that they saw the experimenter's distracting movement toward the marbles as one of counting. Only 4 (27%) subjects claimed that they assumed that the marbles were going to be used for the towers. The difference between

the number of subjects who thought the marbles would be used and the number that thought the same for the cylinders in the first experiment was significant ($p < 0.025$, Fisher exact probability test).

Discussion:

The result in Table 4.2 (a) that few of the subjects in the present experiment gave Yes-responses confirms that the situational suggestion about using cylinders in the first experiment was responsible for the Yes-responses of the young subjects there.

The further result that few of the subjects in the present experiment gave the failure-response (Table 4.2 (b)), similarly confirms that the suggestion about using the cylinders in the first experiment was responsible for the failure-response of the young subjects there.

However, the number of subjects who gave the Yes-responses in the present experiment was only a little less than one would expect to occur by chance alone. The second result was not significant. These weak results imply that we will not be right in claiming on account of the second experiment alone, that the suggestion in the first experiment was responsible for the responses of the young subjects there. Nevertheless, one could still consider the possibility of an alternative explanation for the results of this last experiment. The very direction of the results encourages this.

The results in Table 4.2 (c) suggest that most of the subjects in the experiment did not think that the marbles were to be used for building towers. Nevertheless, it is still possible that many of them wondered whether the experimenter knew of a way of building with the material. The typical comment made by some of the subjects while the experimenter counted it can probably be taken as supporting

this notion. This was 'How are we going to build with those ones?'. If this should have been the case, the subjects could have experienced a strong pull between a prior knowledge that marbles cannot be used to build towers, and a thought that the experimenter might have a plan to use them for the purpose. This should have caused more of them than might have done so, to take the critical question to refer to the material; and, therefore, to give Yes-responses.

A main reason for suspecting that the subjects might after all have wondered whether the marbles will be used is the suggestive value in the task of the experimenter's counting. The act, we noted before, is strongly consistent with the idea of obtaining more of what was needed for the towers. This meaning of the act should have a very powerful effect on the judgement made about any material that it is performed upon in that kind of situation. It could, therefore, have served to induce the subjects in the present experiment to wonder whether the marbles will be used. It is worth noting in this regard, findings which show that young children's reactions to relatively neutral objects can be significantly influenced by the name or use suggested for the objects.

Grieve, Hoogenraad and Murray (1977), for example, presented children aged 2 years to 3 years 9 months with large (10 cubic cm) and small (6 cubic cm) open pliable cardboard boxes to carry out instructions involving the prepositions 'in', 'on', and 'under'. In different tasks with the same children, the same two boxes were referred to as, table and cup; bath and baby; and table and chair. Young as these children were, they reacted differently to the prepositions as the names of the boxes were changed. One of the

important implications of this result is that even very young children can be highly susceptible to the kind of suggestion involved; easily treating one object as if it were another, or as if it could serve as another object.

In a similar fashion to Grieve et al, one can consider the experimenter's counting of the marbles in our task as equivalent to giving them the name 'building material'. If the children take the material as such temporarily, then they should react to it accordingly.

It follows from the explanation offered that we need not take the results of the experiment to mean that the suggestion about using the cylinders in Experiment 4.1 was not responsible for the responses of the young subjects there, for a similar suggestion might have been arrived at about the marbles to account for the results in Experiment 4.2.

Another conclusion, which would follow, is that we should never base our expectations of young children's behaviour on our expectations of adult behaviour alone. This conclusion substantiates the results from the studies mentioned in chapter 2 which show that children sometimes arrive at assumptions which, from an adult point of view, are odd and unexpected.

It also follows for Piagetian concrete-operations tests that children may arrive at alternative situational interpretations of questions when we least expect them to, and they may, therefore, fail when we least expect them to. This is something which has to be borne in mind when the presence of specific cognitive abilities is the main concern. Quite often, this is the primary aim for giving tests to children; the eventual aim, usually, being to

determine which children will require which instructions. In such circumstances, it will be necessary to avoid those situations which would cause them to give incorrect situational interpretations, and so fail to display abilities which they in fact possess.

The experiment reported next, like the present one, was concerned with investigating the position that the situational suggestion about using the cylinders was responsible for the responses of the subjects in the first one. We considered that such further investigation was necessary in spite of the explanation offered for the not-so-significant results of the present one.

Experiment 4.3

Introduction:

The investigation here was based on the same consideration as that of the last experiment; that is, if the suggestion about using the cylinders was not responsible for the responses of the subjects in Experiment 4.1, the same kind of responses as before (Yes-responses) should be given when the situation of the task is such that an assumption about use cannot be made. To achieve this in the present experiment, instead of counting the cylinders as before, the experimenter shook them noisily in both hands. Now, this act can only have negative implications for the given objective of the task. Unlike the act of counting, it is not at all consistent with the idea of obtaining more of whatever is of use for building the towers. The consistency of that act in the task, we explained in the introduction to Experiment 4.1, was expected to contribute partly to the suggestion that the cylinders would be used. The shaking act being inconsistent, therefore, it was not expected for its situation that subjects would assume that the material would be used.

The experiment involved a new group of young children.

Subjects:

Fifteen nursery school children ranging in age from 5 years 0 months to 4 years 0 months (mean age 4 years and 6 months).

Materials:

The same as for Experiment 4.1.

Design:

There was only one group of children; denoted as Group III.

All the children were treated to the same condition.

The results obtained were compared with those obtained for the young treatment subjects (Group I) in the first experiment.

Procedure:

The task was given as in the first experiment, except that instead of counting the cylinders, the experimenter gathered them in both hands and shook them noisily for some 15 seconds.

Results:

TABLE 4.3 (a)

Numbers of subjects in the different response-categories

	N	Yes-responses	No-responses	Question-responses
GROUP III 5 years - 4 years	15	3 (+1)	9 (+2)	3 (-3)
GROUP I 4 years 8 months - 4 years 2 mths	15	11 (+1)	2 (+1)	2 (-2)

The number of subjects who gave Yes-responses in the present experiment was much less than the number that did so in the first one. The difference was significant ($p < 0.01$, Fisher exact probability test).

TABLE 4.3 (b)

Numbers of failure-responses and other responses

	N	Failure-response	Elaborated-response	No-response
GROUP III	15	2	2	9 (+2)
GROUP I	15	9	2 (+1)	2 (+1)

The number of subjects who gave the failure-response in the present experiment was much less than the number that did so in the first one. The difference was significant ($p. < 0.025$, Fisher exact probability test).

TABLE 4.3 (c)

Responses given to questions Q2 and Q3

	N	Q2		Q3	
		Shaking them	I don't know	Build them	I don't know
GROUP III	15	10	5	4	6
GROUP I	15	14	1	11	3

67% of the Group III subjects claimed that they took the experimenter's distracting movement to the cylinders to be one of shaking. Only 27% of the subjects claimed to have assumed that the cylinders would be used for the towers. The difference between the experiment and the first one in the number that made the assumption was significant ($p < 0.025$, Fisher exact probability test).

Discussion:

The result in Table 4.3 (a) that only a few of the subjects in

the present experiment gave Yes-responses indicates that the suggestion about using the cylinders in the first experiment was responsible for the Yes-responses of the young subjects there.

The result in Table 4.3 (b) that only a few of the subjects in the experiment gave the failure-response also suggests that the suggestion about using the cylinders was responsible for the failure-response of the young subjects in Experiment 4.1.

Unlike the outcome of the last experiment, the two results of the present one were satisfactorily significant. They leave no doubts, therefore, about the role of the suggestion in Experiment 4.1.

The results of the present experiment were also taken to suggest that some explanation of the kind which we offered must account for the results obtained in Experiment 4.2. In other words, they support the explanation there that, more subjects than expected gave Yes-responses because more of them than admitted it must have assumed that the marbles would be used for building. If this was not the case, it would be difficult to reconcile the results of Experiments 4.2 and 4.3.

Apart from this indirect support, the present results also constitute direct support for that explanation. The presumed suggestive value of the experimenter's counting was put forward as an agent for the consideration that the marbles would be used. Here, unlike the case in that experiment, cylinders were employed which can easily be used for building towers. However, the cylinders were not counted by the experimenter as before. Instead, an inconsistent act was performed on them. In a way, the fact that most of the subjects tested did not arrive at an assumption that the material would be used in building (Table 4.3 (c)), confirmed

the suggestive value of the counting in the marble experiment.

There is, however, one slight problem for our results. It could be considered that the suggestion generated by the experimenter's act influenced our young subjects, partly because the act immediately preceded the critical question. This is what is described in psychology as the recency-effect; that is, a subject is influenced by the more recent position of a stimulus item; he reacts to it because it is presented last. It has been observed for many learning situations that young children are more susceptible to this particular effect than others are, and it is taken into consideration in many cognitive tasks, including Piaget's.

However, if our young subjects could have given less weight to the suggestion from the experimenter's act, were the act differently placed, it will be necessary to modify the claim that children give more weight to situational suggestions than others do when interpreting test questions. The next experiment was conducted to investigate this hypothesis.

Experiment 4.4

Introduction:

This experiment aimed to investigate the role of the temporal relationship between the situational suggestion and the critical question in our task in the use of the former by subjects.

As might be expected, the manner in which the investigation was carried out was to present subjects with a suggestion that the cylinders will be used at a very early stage of the task (and not just prior to the critical question as before). This change in the position of the non-verbal suggestion made necessary a few modifications in the task. These will be described a little later on, and as will be seen, the changes do not alter the principles of the task.

The experiment was carried out with a new group of subjects. The consideration made was that if only a few of the young subjects tested under the circumstances gave Yes-responses, it will mean that the temporal nearness of the situational suggestion and the question in our experiments has a part to play in the influence of the suggestion on subjects' interpretations.

Since the task was being given in a new form, it was considered appropriate to test some adult subjects along with the young ones. It was felt that it could be suggested that the kind of difference found between the two groups with the last form should not necessarily be assumed for the new form; that is, even if it were to be found with the new form that young subjects again give a lot of weight to the situational suggestion, it would not be impossible that adult subjects would this time do the same. As we pointed out in the introduction to the first experiment, if adults behave in the same

way as young children in the kind of situation, there will be little point in drawing special conclusions about young children from the results.

Subjects:

(i) Fifteen nursery school children ranging from 4 years and 8 months to 4 years and 1 month in age (mean age 4 years and 5 months).

(ii) Ten university students.

Materials:

These were the same as for the first experiment.

Design:

There was only one group of children denoted as Group IV.

There was only one group of adults denoted as Group IVB.

All subjects were treated to the same condition.

The results obtained were compared with those obtained for the young treatment subjects (Group I) and adult subjects (Group IB) in the first experiment.

Procedure:

The setting was the same as for the previous form of the task. Without saying anything or replying to any statements from the subject (S), the experimenter (E) built a tower with the cylinders lying to the left of the table. This was expected to suggest to subjects that towers will be built with the cylinders. In the same quiet manner that she built the tower, E dismantled it. After the dismantling, E picked up Box 1 sitting on the table and took out the blocks from it. E then entered into the following dialogue with S.

E - What are these (indicating the blocks) called?

S - Blocks

E - They are called blocks, good.

Do you know what we shall be doing in this game?

We shall be building towers, and tall ones at that.

You will build one and I will build one too.

Some few seconds after, E, indicating Box 2 with her index finger, presented the critical question:-

E - Are there any of them in that box under your chair?

The differences between the present form of the task and the former one

1) Unlike in the former situation, in the present one E actually built a tower with the cylinders. It was felt that if the assumption about the cylinders was to be induced at the initial stage of the task, and through an act of the experimenter's as before, this was probably the only way in such circumstances in which to achieve the communication. It could be asked why this method of making the suggestion was not adopted in the former task. The reason is that as things were in that situation, building with the cylinders would have been quite inconsistent or abnormal.

2) In the present task, unlike in the previous one, E did not make a direct suggestion about building with the blocks. But the suggestion was still a verbal one and clear enough. The reason for the less direct method was that it was felt that a too direct verbal suggestion about the blocks in the kind of situation could have produced a counter-suggestion that the cylinders were not really intended for use, should the assumption have been arrived at in the

beginning.

3) The word 'more' is absent from the question of the present task. It was felt that it would have been out of place should it have been included. It was not indicated here, as in the former one, that more of something was going to be obtained, and neither was anything counted. Both these factors made the idea of 'more' in the question for the previous form of the task seem in order.

Important similarities and essential qualification:

As we observed in the introduction to the experiment, the principles of the present form of our task are the same as those of the previous form. Since the new form resembles the first experiment in particular, we shall make comparisons with it. In both cases the experimenter's act makes a suggestion which leads to the interpretation that the critical question refers to the cylinders as well as the blocks.

While the same kinds of responses should be given here as before, there is a slight difference in the possible implications of the Yes-responses. The difference is created by the fact that there can be no question of failing to think about the blocks in the situation. The suggestion about using the cylinders is presented first, the one about the blocks only after it. If a subject gives the non-elaborated Yes-response, therefore, it will not be possible to suggest as before that he does this because of a failure to attend to what the experimenter said about the blocks. In other words, the response cannot be termed a 'failure-response'.

In any case, what was of greater interest in the experiment was finding out whether or not our subjects will give Yes-responses in general; that is, whether or not they will give a situational

interpretation to the critical question. Placing the responses into the failure and elaborated sub-categories was, therefore, not warranted. This condition, however, was no reason why the number of subjects who gave the non-elaborated response should not be of some interest.

Results:

TABLE 4.4 (a)

Numbers of subjects in the different response-categories

	N	Yes-responses	No-responses	Question-responses
Group IV 4 years 8 months - 4 years 1 month	15	10 (+1)	3 (+1)	2 (-2)
Group I 4 years 8 months - 4 years 2 months	15	11 (+1)	2 (+1)	2 (-2)
Group IVB Adults	10	2	7 (+1)	1 (-1)
Group IB Adults	10	-	7 (+3)	3 (-3)

1) The number of young subjects who gave Yes-responses in the present experiment (Group IV) was nearly the same as the number that did so in the first (Group I). There was no significant difference between the two results (Fisher exact probability test).

2) There was a significant difference in the present experiment between the adult subjects and the young ones in the kinds of responses given ($p < 0.025$, Fisher exact probability test).

3) The number of adult subjects who gave No-responses in the

present experiment (Group IVB) was nearly the same as the number that did so in the first one (Group IB). There was no significant difference between the two results (Fisher exact probability test).

TABLE 4.4 (b)

Numbers of non-elaborated Yes-response and other responses (young subjects only)

	N	Non-elaborated responses	Elaborated -responses	No-responses
Group IV	15	9	1 (+1)	3 (+1)
Group I	15	9	2 (+1)	2 (+1)

The number of subjects who gave the non-elaborated Yes-response (failure-response) in the present experiment was the same as the number that did so in the first one.

Discussion:

The result that almost as many young subjects as before gave the Yes-responses (first result, Table 4.4 (a)), indicates that the position of the suggestion in our task has no part to play in its influence on the subjects' interpretations.

The result that most of the adult subjects did not give the Yes-responses (second and third results Table 4.4 (a)), helps to confirm that these responses are not the only ones which can be given in the situation.

Recalling the consideration made at the end of the discussion of the last experiment, it is suggested that we need not modify

the claim that children give more weight to situational suggestions than others do when interpreting test questions.

The result that many of the young subjects tested gave the non-elaborated Yes-response (Table 4.4 (b)) helps in a way to substantiate the finding for the first experiment regarding the failure-response.

However, there is an important criticism which might be made against the methodology of the present task. This criticism has to do with the fact that the experimenter actually built a tower with the cylinders to induce the assumption that the material will be used. It could be considered that the suggestion was given an emphasis which it was not given in the first form of the task. This, it could be argued, might account partly for the fact that many of the young subjects tested gave it weight. This explanation, like the recency-effect one, will call for a modification of the claim that children give more weight to what situations suggest about experimenter's meaning for test questions.

The evidence which we have to counter this objection comes from the responses of the adult subjects who did not give much weight to the suggestion. If it was emphasized that much, most of the adults should have given it weight. It follows that even if it were true that the suggestion was given a little more emphasis than before, the added emphasis was not so much as to cause subjects to take it into strong account if they do not normally do such in test situations. Also, it is possible to argue that the suggestion was not unduly emphasized. Actually building towers with the cylinders may be no more direct an action than counting them as before. The two kinds of actions should be equally engaging.

A general discussion of the experiments will be given in chapter 7.

Chapter 5

Conservation and the Tower-Building Task Compared

Introduction

The experiment reported in this chapter puts to test the assumed relationship between the interpretative behaviour of children in the traditional Conservation Task and the Tower Building Task.

We administered the tower task and the number conservation task to a new group of children. The idea was that if the children who fail to conserve on the conservation task are the same ones who give Yes-responses on the tower task, and if the ones who give conserving responses are also the ones who give No-responses on the tower task, the assumption that children respond to the conservation question in the same way that they respond to the critical question in the tower task will be considerably strengthened.

We still have not shown an age affect for behaviour on the tower task; something which has been shown repeatedly for conservation. This new experiment will be an opportunity to do so since we expect to have young non-conserving children as well as slightly older conserving children. Any age effects found will serve as additional support for the assumption that children behave on the Conservation test as they do on the tower test.

Subjects:

(i) Fifteen nursery school children ranging from 4 years 8 months to 4 years in age (mean age 4 years 4½ months).

(ii) Seventeen primary school children ranging from 5 years 8 months to 4 years 11 months (mean age 5 years 3 months).

Materials:

(i) The materials for the tower-building task were the same as for the first experiment.

(ii) The materials for the number conservation task were blue and orange coloured counters of $1\frac{3}{4}$ inch diameter.

Design:

All the children were treated to the same condition. Each child received the two tasks in a single testing session. The tower task was always given first.[14]

Procedure:

The tower-building task was administered here as in the first experiment.

The number conservation task was given in both the number equal and number unequal forms.

In the number equal situation, two rows of four counters were formed. In the number unequal situation, on the other hand, one row had four counters and the other had five.

One half of the children received the number equal situation first, and the other half received the number unequal situation first.

The introduction to the task consisted of the experimenter asking the child what the counters were or looked like. The experimenter then went on to inform him that the game to be played with the 'counters' will involve E arranging them on the table and asking some questions about them. The child was also warned to attend very carefully to the questions.

Following the preliminaries, E arranged the counters in one-to-one correspondence, and then asked:

E - Is there more here or more here or are they both the same number? (with E indicating each row in turn)

After a correct judgement of the rows, E said,

E - Now watch .....

Upon this statement, E went on to move the counters in one row till they touched each other. The row transformed was always the one nearer to E. (This row was also the more numerous one in the number unequal situation.) One colour was transformed in one situation while the other colour was transformed in the other.

Following the transformation, the above question was asked once more -

E - Is there more here or more here or are they both the same number?

Where a subject gave a non-conserving judgement, s/he was asked to count the counters in each row, and the conservation question was then repeated.

Where a subject gave a conserving judgement, on the other hand, s/he was given further questions like,

E - Or does this row have more? (with E indicating the longer row).

Scoring:

Subjects were scored either as giving a conserving response or a non-conserving response, and either as giving a Yes-response or a No-response on the tower-building task. (Subjects were scored as

giving conserving responses even if they did so in only one of the two conservation situations. However, this happened for two children only).

A 2 x 2 contingency table was designed which allowed us to place subjects in the following four categories, indicative of performance correlation.

A - Yes-response and a conserving response

B - No-response and a conserving response

C - Yes-response and a non-conserving response

D - No-response and a non-conserving response

To investigate age-related performance, separate 2 x 2 contingency tables were designed for the tasks which allowed us to place the subjects according to age group and type of response given.

Results:

TABLE 5 (a)

Numbers of subjects falling into categories A, B, C and D

	Yes-response	No-response
Conserving -response	A: 5	B: 14
Non-conserving -response	C: 10	D: 3

N = 32

24 of the 32 subjects showed similar performance on the tower-building task and the number conservation task (cells B and C). The difference in performance on the tower building task by conservers and non-conservers was found to be significant ($p < .01$, Chi-square test).

TABLE 5 (b)

Responses on the tower task by the different age groups

	Nursery Group	Primary Group
Yes-responses	10	5
No-responses	5	12

N = 32

The number of primary school subjects that gave Yes-responses was relatively less than the number of nursery school subjects that did so. The difference was found to be just significant ($p < 0.05$, Chi-square test).

TABLE 5 (c)

Responses on the number task by the different age groups

	Nursery Group	Primary Group
Non-conserving -responses	10	3
Conserving- responses	5	14

N = 32

The number of primary school subjects who gave non-conserving responses was relatively less than the number of nursery school subjects that did so. The difference was found to be significant ($p < 0.005$, Chi-square test).

Discussion:

The results indicate that children respond to the conservation question in the same way that they respond to the critical question in the tower task. In most cases, the subjects who gave conserving responses also gave No-responses on the tower task, and the subjects who gave non-conserving responses gave the more situation-dependent Yes-responses (Table 5 (a)). Moreover, it is indicated that as for conservation, young children respond differently on the tower task as they become older (Tables 5 (b) and 5 (c)).

However, it is worth noting that so far, our investigations have involved utterances whose key terms possess only minimal lexical content. For a more complete examination of the extent of children's preferential reliance on situational clues rather than linguistic ones, it is necessary to test children in circumstances where the referent of the key expression is more determinate than is the case with the diectic used in the tower task or the quantitative term used in the conservation question. The experiment reported in the next chapter was designed to do just this.

Chapter 6

The Black and White Boxes Task

Introduction

The experiment reported in this chapter was designed to find out whether young children give preferential weight to situational suggestions when responding to utterances involving lexical terms with more determinate reference. A new kind of situation was devised in which subjects were actually forced to choose between what the experimenter says and what her action suggests.

The experiment began with the experimenter telling the child that toy-men will be built up. By toy-men was meant figures which are made up by slotting pieces on to a peg. The set given to the child (to make up a London policeman) was an incomplete one. But he did not discover this until he had used up all the pieces he was given. The result of his effort was a policeman with a piece obviously missing from it.

Upon the child's discovery of the loss, the experimenter went on to suggest that she knew the whereabouts of the piece. There were two boxes at opposite ends of the table at which the subject sat with the experimenter; one was black and the other was white. The experimenter named one of these two boxes as containing the missing piece. However, at the same time as making the verbal statement, the experimenter pointed directly at the box not named as if the missing piece was contained in this.

In the circumstances described, it is just as likely for the missing object to be in the box named as it is for the object to

be in the box pointed at. However, the object cannot be in the two boxes at the same time and the subject is compelled to act either on the basis of what the experimenter says or on the basis of what her pointing suggests. It is reasonable to expect that what course is taken will be determined largely by the amount of weight assigned to what is said and what is done. Specifically, the results of the experiments reported in chapter 4 will lead us to expect that most young subjects will act on the basis of the experimenter's pointing.

Subjects:

Twelve nursery school children ranging from 4 years and 11 months to 4 years in age (mean age 4 years and 6 months).

Materials:

(i) Incomplete pieces of a pile-up London policeman. Complete pieces of a pile-up upright cat.

(ii) Two square wooden boxes - about $4\frac{1}{2}$ inches deep and $4\frac{1}{2}$ inches wide. One was painted white, and the other painted black.

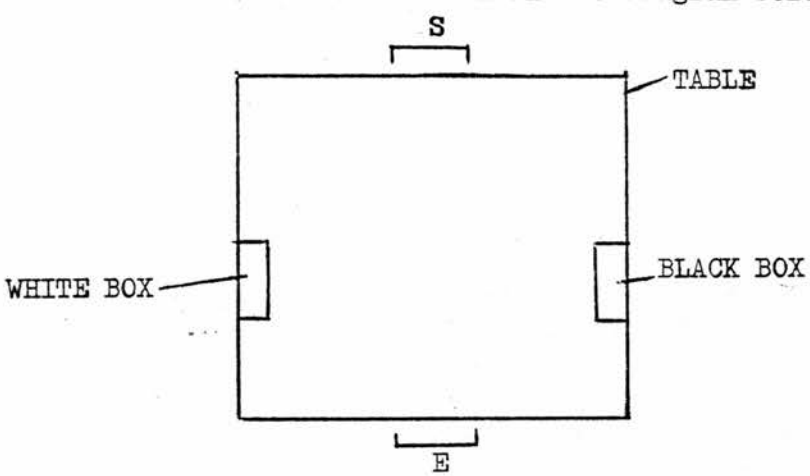
Design:

There was only one group of subjects and they were all treated to the same condition.

Half of them had the experimenter naming the black box and pointing at the white one. The other half had the reverse of these conflicting instructions.

Procedure:

The experimenter (E) and the subject (S) sat opposite each other at a square table. The two boxes were placed at the other sides of the table as shown in the diagram below.



The boxes were placed to be nearer to E than to S to prevent S from getting a premature glimpse of their insides. (They were both empty).

After some general questions to put S at ease, the following dialogue was initiated:

E - Have you ever tried to build up toy-men?

S - Yes/No

E - We are going to build up toy-men, and we want to see who is going to be first to finish building.[15]

E went on to produce the pile-up pieces from a previously concealed cardboard box, giving S the incomplete set, and herself the complete one. S was told that his pieces would give him a London policeman. He was then told to start

building, and fast.

While E and S were both engaged in the task of piling up their pieces, references to the two boxes on the table were discouraged. Also, E always allowed S to finish first.

When S had slotted all his pieces, and in the correct order, E exclaimed,

E - "You have finished! Oh, but it seems you have a piece missing from your policeman. Now, where is it? I remember, IT IS IN THE BLACK/WHITE BOX" - and at the same time - E INDICATED THE WHITE/BLACK BOX with the index finger.
(E looks directly at S during this conflicting behaviour)

Scoring:

Three kinds of reactions were found during the pilot studies, and these were named according to their nature.

a) Inert Reaction - Refusing to act or talk.

b) Question Reaction - Asking E which box she meant.

c) Spontaneous Reaction - Acting without much hesitation.

What E said to S following the reaction varied for the different reactions.

a) Where S refused to look into one of the boxes or to ask questions but simply fidget in his seat, he was told,

E - 'Go on, get it', or 'Go,on, look for it'.
(This was found to be quite effective in getting the subjects into active motion.)

b) Where S asked which one E meant, he was asked in return

E - 'Which one do you think I mean?'
(The reply given to S's consequent choice was 'Yes' irrespective

of whether this was the box pointed at or the one named in E's speech).

c) Where S acted without having to be urged on in any way, nothing was said to him.

Since the two boxes were empty, whichever one S looked into, the reaction was the same one of disappointment, and E only murmured something about the missing piece being lost.

Subjects were categorized according to the above three reactions. They were also categorized according to whether they eventually chose to search the box named in E's speech or the one pointed at.

Results:

TABLE 6 (a)

Numbers of subjects giving the different reactions

a) Inert Reaction	b) Question Reaction	c) Spontaneous Reaction
8	2	2

N = 12

8 subjects gave the Inert Reaction, and 2 gave the Question Reaction. Both reactions are indicative of uncertainty as to which of the boxes to choose, and should, therefore, be lumped together. When this is done, we see that 83% of the subjects had difficulty in deciding which box contained the lost item.

TABLE 6 (b)

Numbers of subjects searching the different boxes

Box pointed at	Box named in E's speech
2	10

N = 12

83% of the subjects eventually chose to search the box named in E's speech. (The 2 subjects who chose the box pointed at were not exactly the ones who gave a Spontaneous reaction. One of the 2 subjects who showed this reaction chose the box named in E's speech).

Discussion:

The result that all but two of the young children tested experienced a conflict in the task (Table 6 (a)) indicates that they understood what the experimenter said and also understood what her pointing implied. However, it is very surprising that only two of the children gave the Question Reaction; which is the reaction that one would expect from older children, for example. In fact the two subjects whom we have given as giving the reaction did not really ask proper questions. One of them, while pointing at the box named in E's speech, and without getting up, said, 'That is the white one'. This was said in such a way which suggested that the child wanted E to correct herself. The second child, doing very much the same as the first (that is, pointing at the box named in E's speech), and grinning mischievously in addition, said, 'It is in that one'.

The result probably supports other ones which have shown young

children to fail to ask questions spontaneously, when faced with ambiguous messages in test situations. (See, for example, Cosgrove and Patterson, 1977; and Bearison and Levey, 1977.) One possible reason for the behaviour in our own situation is that the children knew or felt that E knew what she had done; that is, they knew that her pointing in the opposite direction to her speech was deliberate. This might have bewildered and inhibited or incapacitated them.

And incapacitated they were. Most of the children looked shocked or very surprised. A few even looked very disturbed. However, even though they did not voice questions, the facial expressions and eye-movements of many were indicative of questions. Silent eye-trips were made from the box pointed at to E, and then to the box named in E's speech.

Nevertheless, the main point of the reactions shown is that our subjects did not only understand what the experimenter said, they also understood the implications of her pointing. The eventual searching of one of the boxes, therefore, was undoubtedly the outcome of a hard and forced choice.

Contrary to what the results of the experiments reported in chapter 4 will lead us to expect, all but two of the subjects acted on the basis of what the experimenter said; that is, they chose to search the box named in her speech rather than the one which she pointed at (Table 6 (b)). The experiment was repeated with a different group of 14 children and the same result as before was obtained. Twelve out of the fourteen children acted on the basis of what the experimenter said. These results suggest that where

lexical terms with more definite interpretations are involved, young children do not give preferential weight to situational suggestions. It follows that we must give serious consideration to the nature of the key terms used in Piagetian concrete-operations tests in our attempt to explain children's behaviour on the tests.

Chapter 7

General Discussion of the Experiments

This chapter reviews the experiments reported in chapters 4, 5 and 6. We shall consider first the experiments in chapter 4 and we shall begin the discussion by going over some of the results from Experiment 4.1.

We saw in that experiment how many of the young subjects given the tower-building task (treatment condition) gave what we have termed 'Yes-responses' in reply to the critical question put to them. In contrast to the young 'treatment' subjects, only two of the young subjects who received a different condition (no counting of cylinders) gave the Yes-response. These results were taken as evidence that the experimenter's counting in the treatment condition was responsible for the Yes-responses given. The results, together with failure of all adult subjects tested to give Yes-responses, were taken as suggesting that young children give more weight to situational suggestions than others do when responding to test questions.

Not only did we see that most of the young treatment subjects gave Yes-responses, we also saw that many of these responses were of the kind which we said would ordinarily be judged as indicating failure to think of the blocks in the task. This result was taken as suggesting that young children may fail on Piagetian concrete-operations tasks because they give considerable weight to what situations suggest about the experimenter's meaning for the critical questions asked.

We went on to consider the possibility that our young subjects might actually have failed to attend to what the experimenter said about the blocks in the task. This possibility was rejected largely on account of an argument that giving weight to the situational assumption

about using the cylinders, as our subjects did, necessarily entailed taking account of what the experimenter said about the blocks.

We also considered the possibility that our subjects might not have given significant weight to the suggestion about using the cylinders when interpreting the critical question. We could not adduce adequate evidence against this possibility; at least not empirical evidence. Since the whole point of our testing and conclusions depended on a correct view of this, the second and third experiments reported in chapter 4 were devoted to the resolution of this problem.

In the second and third experiments reported in chapter 4, unlike the first one, it was not expected that the subjects would assume that the material acted upon by the experimenter would be used. We, therefore, did not expect young subjects in the latter experiments to give Yes-responses, if indeed the suggestion about using the cylinders was directly responsible for the responses in the first one.

The results from the second experiment did not provide a strong support for the position that the suggestion about using the cylinders was responsible for the responses in the first experiment. However, there seemed to be a good explanation for this equivocal outcome. Moreover, the results from the third experiment did provide a clear statistically significant support for the position.

The fourth experiment reported in chapter 4 was concerned with whether the young subjects tested in the other experiments were influenced by the situational suggestion partly because it was induced just prior to the critical question. We did not find evidence for any such recency effect.

The results of the different experiments taken together will suggest that young children may fail on Piagetian concrete-operations

tests because they give substantial weight to situational assumptions when responding to the critical questions.

Experiment 4.1 was repeated with a different group of young children and roughly the same results as before were obtained. This helped further to confirm our findings. However, there is an important aspect of the results which is yet unexplained. This is why the failure-response ('Yes, there are some of them') was more common than the other kind of Yes-response ('Yes, there are some cylinders but no blocks'). The two responses, as we explained in the introduction to Experiment 4.1, are borne out of giving a lot of weight to the suggestion about using the cylinders. If this weighting alone can account for the responses, it would be expected that the chances of getting one of them should be about equal the chances of getting the other. An additional explanation must, therefore, be sought for the uneven distribution of the responses in our results.

We feel that the necessary additional explanation may come from the fact that the failure-response is unelaborated or brief. (This is comparing it with the other kind of Yes-response). There is evidence that young children tend not to give spontaneous elaborated responses in test situations. This evidence comes mainly from investigations of the ability to communicate effectively. In many such studies, a task is given which requires the child to use language to pick out a particular referent for a second child or adult who acts as his listener. The referent is presented along with one or more other referents. A particularly interesting example is provided by the work of Robinson (1978).

In the study, a number of cards showing drawings of different men were presented. One card, for example, had a man with a blue flag, a red flower, a tall hat, boots and a smile. Another card had a man with a blue flag, red flower, short hat, boots and a smile. In another card, the man shown had a blue flag again, but a blue flower this time, a short hat as in the second card (but not the first), shoes instead of boots, and a smile. The men shown on the other cards were sad faces. However, the important thing was that the drawings were picked such that, identifying any one of them for a listener who holds an identical set (but could not see the identifying card), would require an elaborated message.

The children involved in the study were aged between 5 years 7 months and 6 years 2 months. Many of the younger children gave only very general descriptions at first. With certain probing questions, however, the children's performance improved. (It should be noted that Robinson was more interested in the reason why the children failed to communicate effectively (that is, their understanding of good and bad messages), and not so much in the fact that they failed in this way).

A related study to Robinson's was that of Krauss and Glucksberg (1969). In this case, the child had to identify one of six blocks for another child separated from him by a screen. The children in the study were aged between about 5 years and 11 years. All the age groups recorded very bad (ineffective) communication initially, but the performance of the older subjects improved over the trials while that of the younger ones remained poor. So, as in Robinson's study, the children in this study did not say enough to help their listeners decide on what they really meant. (Krauss and Glucksberg's study has some serious methodological drawbacks.

These have been discussed by Harris, Macrae and Basset (1978) for example. We feel that what could be a more serious problem with the study is the assumption that young children are not capable of elaborated communication in such situations; an assumption which Robinson did not make, and which has not always received empirical support. See, also, Ford and Olson, 1975).

In many studies related to the two mentioned above, it is common to give the child two referents (words), and to ask him to think of a third word which would help his hidden listener to identify a particular one of the two referents. (Glucksberg, Krauss and Weisberg, 1966; Cohen and Klein, 1968; Asher and Oden, 1976). In these cases too, where giving elaborated messages is less relevant, young children have been found to communicate ineffectively.

To return to our own experiments, the result that many of our young subjects gave the failure-response may be likened to the behaviour found in the communication studies cited. But why do the children behave in this way? Do they do so partly because they give a large weight to situational suggestions?

Until quite recently, it was common to explain young children's apparent communicative incompetence as resulting from an inability to conceive the informational needs of their listeners. This idea was originated by Piaget (1926). Now many investigators have been considering alternative explanations for the apparent incompetence, and new evidence does suggest that whatever problems the children have, it is not the case that they are incapable of taking account of their listeners' informational needs.

Robinson's (1978) investigation, for example, led her to suggest that children may fail to give as much information as

required because of an ignorance about the requirements of the communication tasks. She also adduced evidence to the effect that the everyday experiences of the children do not help to tune them to an awareness of such requirements.

Asher and Oden (1976), on the other hand, suggest that children's difficulty might arise from a failure to compare the associative strength of potential messages to the referent and non-referent. (See also Bearison and Levey, 1977). This explanation is different from Robinson's but the two do not contradict each other. In fact, they can be taken together, with Robinson's adding importantly to that of Asher and Oden.

But what bearing do these explanations have on our own results? While there is really no question of comparison, or referent and non-referent in our experiments (at least from the point of view of the children), it is quite possible that they did not recognize the need to be explicit in their responses. This, in part, may explain the failure-response. This additional explanation is still within the domain of the main one which we have put forward. The need to be explicit might elude the children, partly because they take certain kinds of situational information into account, and because they assume this is accessible to others. Particularly relevant in this respect is a finding made by Blank (1975).

Blank (1975) found that removing from view objects which children have to describe makes a significant difference to their descriptive behaviour. When the objects were within view, the children resorted to gestural communication like pointing to pick out one of them for their listener. When the objects were removed from view, on the other hand, the children gave more verbal information about them. Blank explained that young children are comfortable

with the system of gestures, and would, therefore, resort to it whenever circumstances make it possible. She concluded that the behavioural preference could lead investigators to underestimate the child's potential verbal skills.

That Blank's subjects communicated verbally with more effect in the 'objects-removed' situation was an indication that they were more capable of effective communication than they might show. It also indicated that part of the problem for them in the 'objects-present' situation was that they were ignorant of the need for them to give explicit verbal responses. But most important of all, the results constituted evidence that young children's behaviour in test situations is very much governed by their appraisal of the entire situation. The 'objects-present' situation might have aided the ignorance of Blank's subjects, but at the same time, it is suggested that they based their responses on the assumptions about the situation, and about the interrogator (experimenter); specifically, about what he can and cannot see.

There is some evidence to suggest that this kind of explanation applies in the case of our own experiments.

It was observed during testing that subjects who gave the failure-response lifted the box of cylinders onto the table. It would have been assumed then that the experimenter could see for herself that the box contained no blocks. If this should have been the case, then there would have been little or no need (from the child's point of view) to specify that there were no blocks. It would have been enough simply to answer 'Yes' or 'Yes, there are some of them'.

The subjects who gave No-responses, on the other hand, very rarely lifted the box of cylinders. These observations only add to the evidence that young children are very active interpreters, and relatively alert in test situations. They may not do things correctly

but they cannot be accused of mental passivity. It would seem that, where given the opportunity, they take every situational facet into account. It is worth pointing out in this regard that for many of the children given the tower task, it took some time before they were able to make up their minds about whether to use the blocks or the cylinders when asked to choose at the very beginning of the task. It was discovered from some of the children that this delay was caused by the fact that while they saw the blocks as the more common objects used for building towers, they also saw the cylinders as being available in a greater number. In fact, a few of the children had prolonged arguments with the experimenter over this issue. These children, it was discovered later, were the ones who were more talkative, and/or who displayed considerable independence and precocity in the play groups. We should mention that the initial arguments with the experimenter did not seem to have any effects on the responses of the few children concerned. Some of them went on to take the critical question as a reference to the blocks alone and others took it as a reference to the cylinders as well.

To return to our main point, however, young children do not only make decisions about the use to which objects will be put, they also take account of what the experimenter can see. This has important implications for those tests in which it is necessary to have great control over the child's reading of the tests. However, the observations are probably what we should expect. Children's cognitive processes are still undergoing development. They are still in the process of trying to comprehend many things. It is natural that they should undertake as exhaustive interpretations as they can.

It is interesting to note that the responses of the adult

subjects on our task were as brief as those of the young children. But then, one has to take account of the fact that the interpretation which they gave did not really warrant an elaborated reply. It can be argued that if a subject sees the critical question as referring to the blocks alone as they did, there is little need for him to utter much more than 'No'. In other words, there is no real need for him to mention the cylinders, and come out with a response like, 'No, there are none of them (blocks), but there are some cylinders'.

So far, our discussion has been concerned with the results of the experiments reported in chapter 4. The experiment reported in chapter 5 compared performance on the Conservation test with performance on the Tower-building test. The comparison study was conducted to test our assumption that children respond to the conservation question in the same way that they respond to the critical question in the tower task. As we saw, the results provided ample support for the assumption.

In the experiment reported in chapter 6 we tried to find out what young children did where the expressions to be interpreted have more determinate referents than the deictic term used in the tower task or the quantitative term used in the conservation question. The results of the experiment revealed that children do not give preferential weight to situational suggestions in such circumstances.

Chapter 8

Summary and Conclusions

We shall give a brief summary of the preceding chapters, and then try to draw some general conclusions from the experimental findings reported in chapters 4, 5 and 6.

Summary

The thesis has been concerned with the explanation for young children's failure on Piagetian concrete-operations tests. The issue is of considerable importance because it relates directly to the process by which a child becomes capable of concrete-operational thinking.

We have investigated a claim that young children may fail on the tests because they are misled about the reference of the critical questions by the non-verbal communicative contexts.

We noted that when sentences are spoken in everyday life, what we strive to grasp is the message which the speaker intends to communicate by uttering the sentences, and not what the sentences ordinarily mean (linguistic sentence meaning). The message which a sentence is understood to carry, we added, is partly determined by the context of utterance. Furthermore, we commonly assign greater weight to what the context of an utterance suggests about a speaker's message than we assign to what the linguistic sentence meaning suggests. This results in what may be called non-literal interpretations as opposed to literal interpretations which are constructed primarily on the basis of linguistic sentence meaning and which may require more work cognitively. At the same time as messages depend in part on context of utterance, there are some linguistic expressions like deictics, prepositions, and quantifiers which have no meaning on

their own and can only be interpreted within a particular context. The context may be verbal or non-verbal or both. However, the reference or criterion indicated in one context may lack correspondence with that indicated in the other context. In such instances, the verbally-indicated reference may be described as the literal meaning and the non-verbally indicated reference as the non-literal meaning.

It was suggested that young children might be in the habit of giving only non-literal interpretations to test instructions. Where, as is bound to happen sometimes, these interpretations do not correspond with intended literal interpretation of experimenter's meaning, the children will be misled about the reference of the test instructions and will give incorrect responses based on the incorrect interpretations.

In chapter 2, we tried to account for young children giving only non-literal interpretations; particularly those based on the situational (extralinguistic and paralinguistic) aspects of utterance-contexts. The claims that the children depend on their sensitivity to situations for the development and the use of language were discussed. It was suggested that such dependence could cause children to have more faith in situational clues than others do when processing utterances and, therefore, to find it difficult to reduce the weight attached to such clues.

In chapter 3, we reviewed studies by McGarrigle and Donaldson (1975) and McGarrigle et al (1978) who proposed that situational clues cause young children to give incorrect interpretations and incorrect responses in the Conservation and Class Inclusion tests respectively. It became apparent during the review that explanations other than the ones given by the authors could be offered for their results.

The experiments reported in chapter 4 were designed to further investigate the new account employing a test which was new but which was similar to one of the Piagetian tests (Conservation test) in design. The young children studied behaved in the manner prescribed by the new account of their failure, giving considerable weight to what the situation of the test suggested about the experimenter's intention for the critical question asked. The results of the experiment in chapter 5 provided support for our assumption that children's manner of responding in the new test is comparable with their manner of responding in the Conservation test. The results of the experiment reported in chapter 6, for its part, showed that young children do not assign preferential weight to situational suggestions where the expressions to be interpreted have relatively determinate reference. This indicated that the children might have difficulty in dealing with the key expressions used in the Tower test and the conservation question.

Conclusions

Our conclusions must hinge on the account of why children go from giving Yes-responses on the Tower test to giving No-responses on the test. In giving such an account, we shall be speculating on the change from non-conserving responses to conserving responses.

The results obtained in chapter 6 make it clear that it is not that children simply move from a stage where they fail to attend adequately to language to a stage where they attend to it. It will appear that the change(s) which take place are much more subtle than that. We cannot suggest either, that what happens is that children move from a stage where they lack awareness of the indeterminacy

of the reference of deictic terms to a stage where they acquire this awareness. As we noted in the discussion of Experiment 4.1, the data from the Tower test indicated that even the young subjects who gave the shorter version of the Yes-response knew perfectly well that the critical question could refer to the blocks (verbally-indicated) as well as the cylinders (non-verbally-indicated).

At the same time as being aware of the indeterminacy of the reference of the deictic term in the Tower test, the children tested seemed quite happy with this indeterminacy. This can be seen from the fact that they did not appear to be bothered by it and only very few asked the experimenter which item was the reference of the term. This, of course, is not to suggest that the children do not entertain any doubts about deictics.

Rather than concluding that children who give the shorter Yes-response do so because they think 'them' refers only to the non-verbally indicated cylinders, we prefer to interpret this response in terms of concealment of the more elaborated response. We propose that the children are aware of the indeterminacy of the reference of the term, but they have a tendency to give non-elaborated responses. A more elaborated response than the kind recorded from many of the children would have made it clearer that the blocks as well were seen as one reference of the deictic term.

If we applied this account that young children are aware of the indeterminacy of deictics to the Conservation test, we will propose that the children may judge its quantitative term 'more' on the basis of a variety of attributes which may well also include attention to quantity. It is possible that in the same way as for the Tower test, this awareness is not reflected in their responses largely because the

children choose to give the less informative non-elaborated kind of responses. The kind of elaborated response which one would expect the children to give if the theory were correct that they judge also on the basis of quantity is 'There is more (length) there, but this one has more (number)'. (This example is for the number task). McGarrigle and Donaldson (1975) did not make this same suggestion in their account.

However, we do realize while offering the above theory that it has to be investigated further and that will pose several problems. When the child gives the correct pre-transformation judgement of the two lots of material on the Conservation test, it does not follow that he compares the two lots on the basis of their quantities. In the number test, for example, the child may equally well compare only on the basis of length and density to arrive at the correct pre-transformation judgement.

We are yet to consider why children go on to give No-responses on the Tower test. At this juncture, we may turn to some of the findings made by Karmiloff-Smith (1979). She found that at about the age of 5 years, children begin to give evidence of being truly aware of the different functions which the definite and indefinite articles may serve; for example, to focus attention on a number of objects together, to name a plurality of objects, to focus attention on an object in the extralinguistic setting. Moreover, children at this age begin to use a separate morpheme for each function that they wish to convey. In other words, the children enter into a phase when they <u>restrict</u> the meaning which different morphemes can convey. This procedure is a marked contrast to what children of 8 years and above do. The older group manage to indicate several functions with one word.

The change towards restriction at 5 years may help explain the change towards No-responses on the Tower test at about this age. It could be that children enter into a phase when they no longer feel happy about the indeterminacy of deictic terms, and whey they prefer to restrict the reference to only one object. This explanation, however, does not tell us why reference should be restricted to a verbally-indicated object in particular. Here, we may turn to the ideas put forward by Donaldson (1978).

Donaldson (1978) reckons that children go from a stage where they lack awareness of language as a system in its own right to a stage where they gain this awareness. Such increasing appreciation of the potential independence of language may contribute to the development of a preference for verbally-indicated reference for deictics and, consequently, a decrease in reliance on non-verbal aspects. It is worth pointing out Donaldson's hypothesis that the process of learning to read and write contributes to the growth of awareness of language. This process is initiated at about the age of 5 years. The main reason for this hypothesis surrounds the special nature of and demands of written language, as opposed to spoken language. (See, also, Donaldson (1977)). Written language is relatively abstracted from concrete situations and from the directly perceptible needs and motives of others. This quality creates the need for what is written to be relatively self-sufficient; that is, to be explicit and detailed. In the attempt to achieve these requirements, the individual is forced to become more aware of language as a tool and some of the factors which determine our customary employment of it. At the same time, awareness of what one does when one interprets utterances ordinarily is promoted. As Vygotsky (1962) observed, even the

minimal development of writing requires a high level of abstraction. In his comments on the differences between the nature and demands of written and spoken language, Vygotsky wrote:

> "In conversation, every sentence is prompted by a motive. Desire or need lead to request, question to answer, bewilderment to explanation. The changing motives of the interlocutors determine at every moment the turn oral speech will take. It does not have to be consciously directed - the dynamic situation takes care of that. The motives for writing are more abstract, more intellectualized, further removed from immediate needs. In written speech, we are obliged to create the situation, to represent it to ourselves. This demands detachment from the actual situation."
>
> Vygotsky, 1962, p. 99.

The question for us at this stage is whether the foreoing account sheds light on the transition from non-conserving responses to conserving responses on the Conservation test. In so far as the quantitative term in the conservation question behaves like a deictic term, the answer to this question could be yes. If this should be a correct evaluation, it will mean that children move from a stage where they are relatively happy with the indeterminacy of the quantitative term 'more' but fail to make their awareness of the indeterminacy known, giving only non-elaborated responses which rely heavily on non-verbally indicated reference, to a stage where they prefer to restrict themselves to a single criterion for judging the term and rely less on non-verbally indicated criteria.

However, in so far as it is open to argument whether or not young children who give non-conserving responses are aware of quantity as a potential criterion for judging the conservation question, one who is sceptical may contest the idea that conserving responses are arrived at through a process of restriction to a verbally-indicated criterion. A Piagetian investigator, on his part, while he may agree that non-

conservers do not approach the term 'more' in the same manner as conservers do, may argue that the overriding determinant in the change is the increasing presence of the conservation ability. Where the ability is present in the child, it will be argued, the ability should help direct him to quantity. In other words, we need not appeal to the notions of restriction and increasing awareness of language. If one takes this alternative account, one will be faced with the problem of reconciling it with the change on the Tower test from Yes-responses to No-responses and the relationship between this change and the change on the Conservation test. If the change from Yes-responses to No-responses could be due to a restriction of reference and awareness of language, and if performance on the Tower test matches relatively well with performance on the Conservation test, what stops it from being the case that the change on the Conservation test is due to a restriction of criteria and awareness of language? Conservation ability cannot explain change on the Tower test.

We would suggest that the explanation proposed here for the relationship is the more economical.

APPENDIX A

Notes

1. For most psychologists, including Piaget, the average adult is the same as the average formally educated or intellectually sophisticated adult. The same qualification goes for the idea of the average child - this child belongs to a literate Western Society and is at a certain level of formal schooling.

2. The same finding was made by McGarrigle, Grieve and Hughes (1978).

3. An important exception is the imitation of other's actions which Piaget did consider as being very important for the emergence of symbolic representation in general.

4. Towards the end of his life, Piaget was beginning to alter his views. Moore and Harris (1978) report that in a preface to Ferreiro (1971, in French), Piaget suggested two options on the relationship between language and thought. One was his traditional view. The other was that one might see a parallel development in the linguistic and cognitive domain, with different levels of operativity accountable through decalage. He suggested that decoding linguistic structure and solving various cognitive tasks are parallel problems to which the child brings epistemological strategies.

5. Some of the research which has been carried out on non-verbal communication is of relevance here. See, for example, Argyle (1972).

6. It has to be said at this point that investigators have not all been blind to the fact that the situations of formal tests may have undesired effects on the performance of their younger subjects. This is most evident in the care which is always taken in designing such tests to be as simple as possible within the experimental requirements. However, it seems that the same investigators have tended to assume that even where the non-literal interpretation of the instruction given differs from the more literal interpretation, subjects, knowing this, will normally give the literal interpretation.

7. It should be noted that Donaldson and her colleagues, even at the time of the studies, gave attention to the nature of the normal referential contexts of the relational terms.

8. We do recognize that 'failure' in the new task is not equivalent to failure in Piagetian concrete-operations tests.

9. We all know how we sometimes get carried off the point of a task by insignificant distractions, and we may lose touch completely, at least temporarily, with what we were doing before the distraction occurred. It is generally believed that younger children are more prone than older ones to this kind of influence. The act introduced by the experimenter here was intended to have just that kind of effect on subjects. It had on the face of it, nothing to do with what the experimenter said about building with blocks, and it was the kind of act that can readily take up the subject's attention. It should be noted that the items which subjects might forget was <u>what the experimenter said about building</u>

with the blocks. Since the blocks were present on the table all the time, they would not be forgotten.

10. The experimenter's counting might, for example, make subjects forget about the blocks without redirecting them to think of the cylinders. In such a case the response could be something like, "What?".

11. Where a subject indicated that he had never tried to build towers (though this could be insincere), the experimenter tried to reassure him that it was not a difficult thing to do, adding that she would teach him if necessary.

12. Surely, many subjects, especially the adults, could have recognized that the experimenter knew of the presence of this second box. But we expected that they would not recognize the true position for the task at least. This was to find out whether they would take the situational assumption into account. Once this is not recognized, a thought that the experimenter knew of the box under their chair should not have any important effects on subjects' responses.

13. It is necessary to note here that whatever assumption is made about the experimenter's counting is likely to be one that the cylinders will be used for the towers. Whether or not it will be assumed that two separate tasks (one with the blocks, the other with the cylinders) will be carried out is really beside the point. This is because it is still accepted that the cylinders will be used.

14. The tower task necessitated that the materials be laid out before the child entered the testing room. Under such circumstances, the conservation task could not have been given first in the same testing session. An alternative would have been to give the tests in different rooms. This was, however, not possible as the children's schools were short of space.

15. Where a subject responded in the negative, he was assured that the experimenter would see him through the task.

APPENDIX B

Raw Data

Experiment 4.1 Group I (Treatment)

Age in years and months	Initial choice of item to build with	Response to the critical question	Response to Q1	Response to Q2	Response to Q3
4.2	Blocks	No	-	Counting	Don't know
4.2	Blocks	Yes, and paper	Blocks	Counting them	Build them
4.3	Cylinders	Yes	Cylinders	Counting	Build
4.3	Cylinders	Yes	Blocks	Counting them	Build them up
4.4	Cylinders	Yes,look	Blocks	Counting them	Don't know
4.4	Cylinders	Yes	Don't know	Counting them	Build a tower
4.4	Blocks	Yes	Blocks	Counting	Build them
4.5	Blocks	There,there are some	Blocks	Don't know	-
4.5	Blocks	Yes, not some of those kind	-	Counting them	Building a tower
4.6	Blocks	Any more of them? Do you mean them?	-	Counting	Build them
4.6	Blocks	No	-	Counting	Build them
4.7	Cylinders	Yes	Cylinders	Counting them	Building
4.7	Cylinders	Of them? I don't know	-	Counting	Don't know
4.8	Blocks	Yes, only these	-	Counting them	Build a tower
4.8	Blocks	Yes	Blocks	Counting them	Build

Experiment 4.1 Group IA (control)

Age in years and months	Initial choice of item to build with	Response to the critical question	Response to Q1
4.1	Cylinders	No, there is only these	-
4.1	Cylinders	No, only more of them	-
4.2	Cylinders	Look,No, there are round ones	-
4.3	Blocks	No, these are the round ones	-
4.4	Blocks	Yes, only these	-
4.4	Cylinders	No, only them	-
4.5	Cylinders	No, there is more of them	-
4.5	Blocks	No	-
4.6	Cylinders	Only these ones	-
4.6	Cylinders	No	-
4.6	Blocks	No, only these ones	
4.7	Blocks	No	-
4.7	Blocks	No	-
4.8	Blocks	No, just these. There is these ones	-
4.8	Cylinders	Yes	Blocks

Experiment 4.1 Group IB (Adults)

Adults	Initial choice of item to build with	Response to critical question	Response to Q1	Response to Q2	Response to Q3
1.	Blocks	No	-	Counting	I don't know
2.	Blocks	I don't see any	-	Counting	Build the towers with them
3.	Blocks	No	-	Counting	Use them to build towers
4.	Blocks	No	-	Counting	I wasn't sure
5.	Cylinders	Of the blocks?	-	Counting	I was puzzled
6.	Cylinders	No	-	Counting	Use them for the towers
7.	Blocks	Of the coloured ones?	-	Counting	I wasn't certain
8.	Blocks	No	-	Counting	Build the towers with them
9.	Cylinders	No	-	Counting	I could not tell
10.	Blocks	More of which one? I am not sure	-	Counting	Use them for building towers

Experiment 4.2 Group II

Age in years and months	Initial choice of item to build with	Response to the critical question	Response to Q2	Response to Q3
4.0	Blocks	Yes	Counting them	My brother has got marbles
4.1	Cylinders	Yes	Playing with the marbles	Rolling them
4.2	Blocks	No	Counting them	Don't know
4.2	Cylinders	There is only marbles	Counting	Count again
4.3	Blocks	No, its just marbles	Counting	Don't know
4.4	Blocks	Yes	Counting	Build them up
4.4	Blocks	Only marbles	Counting	Don't know
4.4	Blocks	No, just marbles	You were counting	Build a tower with them
4.5	Blocks	Them?	Counting	I don't know
4.6	Cylinders	Yes	I don't know	-
4.6	Blocks	Yes, only marbles	Counting	Build them
4.7	Blocks	More of them?	Counting	Rolling them there
4.8	Blocks	No, there is just marbles	Counting them	Don't know
4.9	Blocks	No	Counting	Don't know
4.10	Blocks	Them? Some more	Counting	Build them

Experiment 4.3 Group III

Age in years and months	Initial choice of item to build with	Response to the critical question	Response to Q2	Response to Q3
4.0	Blocks	Only these ones	Shaking them	Put them down
4.1	Cylinders	Yes	Shaking them	Put them down
4.1	Blocks	Nook, noop	Shaking them up and down	Put them on the table
4.2	Blocks	More of them?	You were shaking them	Build them
4.3	Cylinders	Any more of them?	Don't know	-
4.4	Cylinders	No, there is not	Trying to make a noise	Trying to make a castle
4.5	Blocks	No	Don't know	-
4.6	Cylinders	No	Don't know	-
4.7	Blocks	Yes	Don't know	-
4.7	Blocks	Them?	Shaking them	Put them there
4.8	Cylinders	No, only these	Mixing them	Build a tower
4.9	Cylinders	No	You were shaking them	Build them
4.10	Cylinders	No, only these ones	You were shaking those	Don't know
4.11	Blocks	Yes, only these	Don't know	-
5.0	Blocks	No	Shaking them	Because you want to see if there is any more bricks in there

Experiment 4.4 Group IV

Age in years and months	Initial choice of item to build with	Response to the cricical question
4.1	Cylinders	Yes
4.2	Blocks	Only these
4.3	Blocks	The round things?
4.3	Blocks	Yes
4.4	Cylinders	There is more
4.4	Blocks	Yes
4.5	Cylinders	Yes, some of these
4.5	Cylinders	Yes
4.5	Cylinders	Yes
4.6	Blocks	Yes
4.6	Cylinders	Round (Only round ones)
4.7	Blocks	Yes, there is more
4.7	Blocks	No
4.8	Blocks	Ehm, these?
4.8	Cylinders	Yes

Experiment 4.4 Group IVB (Adults)

Adults	Initial choice of item to build with	Response to the critical question
1.	Blocks	No
2.	Cylinders	No
3.	Blocks	Yes
4.	Blocks	Yes
5.	Blocks	No blocks
6.	Cylinders	Not blocks
7.	Blocks	No, none of these (blocks)
8.	Cylinders	No
9.	Cylinders	No
10.	Blocks	What? Blocks (I am not really sure what you were asking?

Experiment 5 Nursery Group

Age in years and months	Responses on the tower-building task	Responses on the conservation task (number equal)	Responses on the conservation task (number unequal)
4.0	Yes, look	More here	More (less numerous row)
4.0	No	The same	More there (more numerous row)
4.1	Yes	More there	More there (less numerous row)
4.3	Yes	More	More (less numerous row)
4.3	No	Both the same	That one (more numerous row)
4.3	Yes	More there	More in the orange ones (less numerous)
4.4	Yes	Thats more, That's big more there	There is just more there (less numerous)
4.5	No, there are only round ones	The same	No, the blue is still different
4.6	Yes	More there	More there (less numerous)
4.6	No, only those ones	(counted rows first) They are the same number, only they are together	(Counted first) More there (more numerous row)
4.7	Yes, Yes Sir	No, that one (i.e. more in one)	Yes, No (i.e. not the same)
4.7	Yes sir	Yes, No	Yes, (i.e. both the same)
4.8	Yes, there are	The are not the same number	More there (less numerous)
4.8	Yes, No, circles ones	Not the same	More there (less numerous)
4.7	Yes	More there	More there (less numerous)

Experiment 5 Primary Group

Age in years and months	Responses on the tower-building task	Responses on the conservation task (number equal)	Responses on the conservation task (number unequal)
4.11	No	More there	More there (less numerous)
5.0	Only these	They are both the same	There is more there (more numerous)
5.1	No	Both the same number	That one (more numerous)
5.1	Yes	They are the same	More there (more numerous)
5.2	No	The same	No, more there (more numerous)
5.2	Yes	They are both the same	That one (more numerous)
5.3	Yes, more	More there	Not the same
5.4	Yes	The same	More there (more numerous)
5.4	No	Both the same	There is more in that one
5.5	No	More there	More there (less numerous)
5.5	No, only these	The same	More in that one (more numerous
5.5	No	Both the same	They are not the same
5.5	No	They are the same	No, more there (more numerous)
5.7	No, just these	They are the same	There is more there (more numerous
5.7	Yes	There is more there	More there (less numerous)
5.8	No	The same	More in that one (more numerous)
5.8	No, only the round things	They are the same number	More there (more numerous)

Experiment 6

Age in years and months	Initial reaction	Reaction category	Box searched
4.0	Looked in the direction of E's finger, then at E, nodding but not budging.	Inert reaction	Box named in speech
4.1	Looked in direction of E's finger first. Searched named box.	Spontaneous reaction	Box named in speech
4.2	Got up, then looked at E (waiting)	Inert reaction	Box pointed at
4.4	Nodded while eyes darted to the box named. Eyes then moved to box pointed at. Then, touching named box asks "That is the white one"	Question reaction	Box named in speech
4.5	Looked in direction of E's finger very briefly. Eyes darted to box named. Made as if to go for it, but recoiled and gave a worried look, fidgeting in her seat.	Inert reaction	Box named in speech
4.6	Eyes darted to box pointed at, then back to E. Subject then broke into a grin. She kept nodding emphatically but refused to move at first.	Inert reaction	Box named in speech
4.7	Looked at direction of E's finger then at E. Made no attempt to get up until coaxed to look for it.	Inert reaction	Box named in speech
4.7	Eyes darted in direction of E's finger. Subject then got up grinning and picked the box named.	Spontaneous reaction	Box named in speech

Experiment 6 (contd.)

Age in years and months	Initial reaction	Reaction category	Box searched
4.8	Eyes went in direction of E's finger, then to E. Subject grinned, then looked serious, and got up to look under table.	Inert reaction	Box pointed at
4.9	Eyes darted in direction of E's finger, then back to E, then to box named, then back to E again, then down to table in front of her. Switch to grinning and playing shy.	Inert reaction	Box named in speech
4.10	Eyes darted in direction of E's finger, then to named box. Pointing to this and looking at E, subject asked "It is in that one"	Question reaction	Box named in speech
4.11	Eyes darted first in direction of E's finger, then to E and back. Made no attempt to move until coaxed.	Inert reaction	Box named in speech

APPENDIX C

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